GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering

May 2, 2007
Project 04516-2

Ms. Irene M. Dale
Environmental Engineer
Bureau of Waste Site Cleanup
Department of Environmental Protection
205B Lowell Street
Wilmington, MA 01887

Dear Ms. Dale:

Re: Immediate Response Action Plan Modification No. 5
50 Tufts Street
Somerville, MA
RTN 3-23246

On behalf of UniFirst Corporation of Wilmington, Massachusetts, we prepared this Immediate Response Action (IRA) Plan Modification No. 5 for a release of chlorinated volatile organic compounds (VOCs) at 50 Tufts Street in Somerville, Massachusetts (the Site). The IRA Plan was originally submitted to DEP on January 9, 2006 and subsequently modified on June 27, September 21, November 13, 2006, and February 22, 2007.

The Massachusetts Department of Environmental Protection (DEP) assigned Release Tracking Numbers (RTNs) 3-23246, 3-24358, and 3-24376 to reported releases associated with the Site. The Site is currently classified Tier IC. The RTNs for the Site were consolidated under RTN 3-23246 at the time the Tier IC permit application was submitted to DEP on June 16, 2006. An additional Release Tracking Number RTN 3-26114 was assigned to Site when tetrachloroethylene (PCE) was reported in two homes.

IRA Modification 5 is for activities conducted at the 50 Tufts Street property (the Property). IRA activities were initiated on February 20, 2007 and are ongoing. These activities were verbally approved by Ms. Irene Dale of the DEP during the frequent phone conversations throughout February 2007 between Ms. Dale and Ms. Ileen Gladstone, P.E., LSP of GEI Consultants, Inc.

The IRA Transmittal Form (BWSC105) for IRA Modification 5 was submitted by eDEP on April 26, 2007 and a copy is in Attachment A.

The Chief Municipal Officer and the local Board of Health has been notified of the response action take to control, prevent, abate or eliminate an Imminent Hazard at 50 Tufts Street. Copies of the notification letters are in Attachment A.

GEI Consultants, Inc.
400 Unicorn Park Drive, Woburn, MA 01801
781.721.4000 fax: 781.721.4073

1. CONTACT INFORMATION

Entity Undertaking the IRA
Brian Keegan
Senior Engineering Manager
UniFirst Corporation
68 Jonspin Road
Wilmington, MA 01887
978.658.8888 ext 645

Licensed Site Professional
Ileen S. Gladstone, P.E., LSP
Vice President
GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801
781.721.4012
LSP License: 9719

2. BACKGROUND

Chlorinated VOCs, particularly PCE, have been measured in soil, groundwater, and indoor air at the Site. The source of the chlorinated VOCs is likely associated with the historic handling, storage, and distribution of laundry and dry cleaning chemicals at the Property. Chlorinated VOCs were measured in an indoor air samples collected in the Property building. Chlorinated VOCs have also been detected in groundwater samples collected from monitoring wells located in the neighborhood east of the Property and in the indoor air in residences located immediately across Tufts Street.

3. IRA OBJECTIVES, PLAN, AND SCHEDULE (310 CMR 40.0424[1][E])

3.1 IRA Objectives

The objectives of the IRA Modification at the Property are to:

- Evaluate the building conditions at the 50 Tufts property regarding the potential for chlorinated VOCs to migrate to indoor air.
- Reduce the potential migration of sub-slab gases to indoor air by installing a sub-slab depressurization system (SSDS) at the 50 Tufts Street property.
- Operate the SSDS in an active extraction mode until elevated VOC concentrations beneath the slab attenuate to steady state conditions.
- Achieve a condition of no Imminent Hazard for full-time commercial occupancy of the Property building for the contaminants of concern at the Site (i.e. chlorinated VOCs).
- Monitor the effectiveness of the mitigation conducted.

3.2 Completed IRA Activities

GEI provided DEP with a preliminary design for the SSDS in our Memorandum "50 Tufts Street Commercial Building –Preliminary Remediation Approach and Schedule," dated March 15, 2007. A copy is in Attachment B.

GEI engaged T.Ford Company, Inc. of Georgetown, Massachusetts to install the SSDS.

3.2.1 Installation of Sub-Slab Monitoring Points

GEI coordinated the installation of 10 sub-slab monitoring points for the SSDS on February 20, 2007. GEI observed Boston Concrete Drilling and T.Ford Construction, Inc. advance 10 cores through the building slab and install durable sub-slab monitoring points. The monitoring points

have been used for ongoing measurements of sub-slab vapor pressure and sub-slab air quality and have provided data to support remedial design and assessment. During installation of the monitoring points, GEI personnel collected information about slab construction and sub-slab soil conditions. Several monitoring points were constructed to also function as pilot-scale extraction points for sub-slab soil gas.

3.2.2 Sub-Slab Extraction Diagnostic Test (March 24-28, 2007)

GEI conducted a diagnostic test to collect information about sub-slab air flow and vacuum distribution to assist with the design of the SSDS. A portable vacuum was used to extract sub-slab. We measured changes in sub-slab pressure and VOC concentrations during testing using a manometer and PID, respectively. The air flow rate and VOC concentration of the discharge were also measured. Details of the diagnostic test are described in our memorandum dated April 13, 2007 and included as Attachment B. One sample of sub-slab soil gas was collected in a canister and submitted for laboratory analysis by EPA Method TO15. A copy of the laboratory testing results is included in Attachment B. Based on the results of these tests, the proposed spacing of the extraction points approximately 50 feet apart is appropriate and will provide overlapping vacuum influence areas when all extraction points are operating.

3.2.3 Seal floor slab joints and macro-cracks – March 21 – April 13, 2007

The construction joints between the perimeter and interior foundation walls and the floor slab represented a significant potential pathway for migration of contaminated sub-slab vapor into indoor air. We estimate that the combination of construction joints, slab expansion joints, and several prominent cracks observed in the slab represented approximately 150 to 200 square feet of exposure to sub-slab soil. . T-Ford cleaned the joints and cracks using mechanical equipment and sealed using a flexible sealant designed to fill active cracks and expansion joints.

3.2.4 Install sub-slab depressurization system – March 21, 2007 - Ongoing

A sub-slab depressurization system is currently being installed both to reduce the mass of contaminants in soils and the migration of sub-slab vapor to indoor air. The system piping is designed so that the system may be operated first in active and later in passive mode.

We will install a temporary blower and initially operate the system in active extraction mode until elevated VOC concentrations beneath the slab attenuate to steady state conditions. The active system will serve to remove these elevated concentrations, remove residual source material in the vadose zone, if present, and allow capture and treatment of the VOCs in the discharge from the system. We will use carbon vessels to treat the off-gas initially but may convert to an alternative treatment technology depending on the results of initial operation and the anticipated duration of operation of the active system. Once the system is running we will evaluate the need for continuing off-gas treatment and controls for the system in conformance with DEP Policy WSC-94-150 "Off-Gas Treatment of Point-Source Remedial Air Emissions (1994)".

The system components will consist of:

- 22 extraction points connected to three manifold pipes;
- Skid-mounted Nash Elmo 15 horsepower regenerative blower, gauges and controls;
- 40-gallon water separator and high-level switch;
- Two 2,000 pound vapor phase activated carbon adsorbers, in series (model Vent-Scrub 2000).

The system will be housed in a temporary enclosure near the southwestern corner of the building and initially operated 24 hours per day. Figure 2 in Attachment B shows the approximate location of the system.

The 22 interior slab penetrations were installed with 2-inch PVC piping connected to above-slab exhaust piping mechanically fastened to the adjacent wall or column. The original concept design did not include connections to all sub-slab monitoring points, however the piping design was modified to include connections in the northern portion of the warehouse and in the office space. The extraction points in the northern portion of the building were originally proposed to be constructed as passive vents. However, elevated VOC conditions were encountered during installation of the points indicating that active vapor extraction may enhance system effectiveness. Piping in the office space extends to the ceiling, and then connects to manifold piping that runs along the ceiling joists of the warehouse to the proposed blower location in the southwest corner of the building. Manifold piping on the western wall of the building was extended to include the northern-most extraction points. A piping sketch is shown on Figure 2 in Attachment B.

We anticipate that the total VOCs removed by the system will decrease over time. The rate of the decrease will be a function of the amount of residual NAPL present in soil, if any, and the achieved extraction rate. After the total VOC concentrations decrease and reach a steady state condition that matches the estimated VOC off-gas rate from groundwater beneath the building, we will shut down the blower and operate the system in passive mode, without off-gas treatment, for the duration of the building's use as a commercial facility. Passive mode consists of ventilation of each sub-slab piping penetration with a wind-driven rotary ventilator installed above the roofline of the building. The installation of the piping penetrations through the roof and the rotary ventilators has been delayed while building permit issues with the City of Somerville are resolved. Once that work is complete, we will test the operation of the system in passive mode to confirm that it meets the remedial goals and does not result in unacceptable discharges to ambient air. Modifications will be made to the system, including potential restoration of active operation, if the goals are not met.

3.2.5 Apply uniform floor coating – Week of April 23, 2007

A floor coating system designed for concrete floors will be applied to the entire floor slab to reduce the potential migration of VOCs through micro-cracks and pores in the concrete. The coating system will consist of two coats of epoxy with a total thickness of approximately 14-16 mil. The floor coating is designed to withstand typical wear and tear consistent with automotive storage and to have chemical resistance to typical automobile-related materials, such as gasoline, oil; and coolant.

4. REMEDIATION WASTE MANAGEMENT

Small amounts of soil may be generated from coring through the basement slab during sub-slab sampling and SSDS installation. We anticipate disposing of this soil as remediation waste. We do not anticipate performing dewatering during the installation of the SSDS.

Off-gas will be treated through activated carbon, the spent carbon will be temporarily stored on site and transported off-site as hazardous waste.

5. ENVIRONMENTAL MONITORING PLAN AND PERMITS

5.1 Environmental Monitoring Plan for Indoor Air

5.1.1. One Week after Active SSDS Start-up and Quarterly for One Year

After one week of operation of the SSDS and quarterly for one year, GEI will measure:

- VOC concentrations of air inside the building using Summa canisters for laboratory analysis by Method TO-15. Samples will be collected at up to six locations.

5.1.2. One Year after Active SSDS Start-up

After one year of operation of the SSDS, GEI will measure once a year during the winter months:

- VOC concentrations of air inside the building using summa canisters for laboratory analysis by Method TO-15.

5.2. Environmental Monitoring Plan for Extraction System

5.2.1. After Active SSDS Start-up

GEI will measure the following on days 1, 7, 14, and 28 after startup of the SSDS:

- Total VOC concentrations at each of the sub-slab monitoring points using a PID.
- Total VOC concentration in the influent and effluent from the carbon treatment system and between carbon canisters using a PID. Samples of the influent and effluent will be collected using Summa canisters on days 1 and 28 and submitted for laboratory analysis by Method TO-15 to verify the PID results.
- Sub-slab pressure at monitoring points using a manometer with a detection limit of 0.001-inch water.

5.2.2. One Month after Active SSDS Start-up and Monthly Thereafter

After one month of operation of the SSDS and monthly thereafter, GEI will measure:

- Total VOC concentration in the influent and effluent from the carbon treatment system and between carbon canisters using a PID.
- System parameters such as flow rate, vacuum, and carbon usage rates.

5.3. Monitoring of Passive SSDS

After the system is converted to passive mode, we will sample off-gas from one representative vent (based on PID results) and from a downwind location using Summa canisters and have them analyzed by Method TO-15 to confirm that the VOC discharge during passive operation is within acceptable limits. We propose to resample from the vent and from a downwind location approximately one month later to confirm the results of the initial test.

5.4. Permits

GEI's contractors will apply for any necessary permits for planned IRA activities, such as electrical permits, from the city of Somerville.

6. SCHEDULE

Much of the work inside the building is complete, including the SSDS extraction points, interior piping, crack sealing of the floor slab and installation of the active system components. Due to the poor condition of the roof, and despite extensive efforts to patch holes and divert rain water with tarps, our contractor cannot make the building water tight. This is delaying the shot blasting and floor coating work. The floor coating is currently scheduled for the week of April 23, but is weather dependent.

Please contact me at 781.721.4012 or igladstone@geiconsultants.com if you have any questions.

Sincerely,

GEI CONSULTANTS, INC.

Ileen S. Gladstone, P.E., LSP
Vice President

HAB/ISG:jah
Enclosures

c: Brian Keegan, UniFirst Corporation

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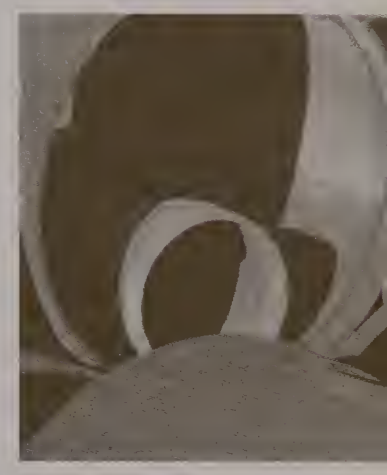

ATTACHMENT A
Immediate Response Action (IRA) Transmittal Form
(BWSC105)

Massachusetts Department of Environmental Protection

eDEP Transaction Copy

Here is the file you requested for your records.

To retain a copy of this file you must save and/or print.

Username:	**HBALLANTYNE**
Transaction ID:	**118635**
Document:	**BWSC 105 IRA**
Size of File:	**140.343 K**
Status of Transaction:	**SUBMITTED**
Date and Time Created:	**4/30/2007::1:36:00 PM**

Note: This file only includes forms that were part of your transaction as of the date and time indicated above. If you need a more current copy of your transaction, return to eDEP and select to "Download a Copy" from the Current Submittals page.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC105

IMMEDIATE RESPONSE ACTION (IRA) TRANSMITTAL FORM

Pursuant to 310 CMR 40.0424 - 40.0427 (Subpart D)

Release Tracking Number: 3 - 23246

A. RELEASE OR THREAT OF RELEASE LOCATION:

1. Release Name/Location Aid: 50 TUFTS ST & PROP ACROSS THE ST

2. Street Address: 50 TUFTS ST

3. City/Town: SOMERVILLE 4. ZIP Code: 02145-4129

5. UTM Coordinates: a. UTM N: 4694314 b. UTM E: 328044

☑ 6. Check here if a Tier Classification Submittal has been provided to DEP for this disposal site.
☐ a. Tier IA ☐ b. Tier IB ☑ c. Tier IC ☐ d. Tier II

☐ 7. Check here if this location is Adequately Regulated, pursuant to 310 CMR 40.0110-0114. Specify Program (check one):
☐ a. CERCLA ☐ b. HSWA Corrective Action ☐ c. Solid Waste Management
☐ d. RCRA State Program (21C Facilities)

B. THIS FORM IS BEING USED TO: (check all that apply)

1. List Submittal Date of Initial IRA Written Plan (if previously submitted): 1/9/2006 (mm/dd/yyyy)

☐ 2. Submit an **Initial IRA Plan**.

☑ 3. Submit a **Modified IRA Plan** of a previously submitted written IRA Plan.

☐ 4. Submit an **Imminent Hazard Evaluation**. (check one)
☐ a. An Imminent Hazard exists in connection with this Release or Threat of Release.
☐ b. An Imminent Hazard does not exist in connection with this Release or Threat of Release.
☐ c. It is unknown whether an Imminent Hazard exists in connection with this Release or Threat of Release, and further assessment activities will be undertaken.
☐ d. It is unknown whether an Imminent Hazard exists in connection with this Release or Threat of Release. However, response actions will address those conditions that could pose an Imminent Hazard.

☐ 5. Submit a request to **Terminate an Active Remedial System or Response Action(s) Taken to Address an Imminent Hazard**.

☐ 6. Submit an **IRA Status Report**.

☐ 7. Submit a **Remedial Monitoring Report**. (This report can only be submitted through eDEP.)
a. Type of Report: (check one) ☐ i. Initial Report ☐ ii. Interim Report ☐ iii. Final Report
b. Frequency of Submittal: (check all that apply)
☐ i. A Remedial Monitoring Report(s) submitted monthly to address an Imminent Hazard.
☐ ii. A Remedial Monitoring Report(s) submitted monthly to address a Condition of Substantial Release Migration.
☐ iii. A Remedial Monitoring Report(s) submitted concurrent with a IRA Status Report.
c. Number of Remedial Systems and/or Monitoring Programs: _____

A separate BWSC105A, IRA Remedial Monitoring Report, must be filled out for each Remedial System and/or Monitoring Program addressed by this transmittal form.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC105

IMMEDIATE RESPONSE ACTION (IRA) TRANSMITTAL FORM

Pursuant to 310 CMR 40.0424 - 40.0427 (Subpart D)

Release Tracking Number: 3 - 23246

B. THIS FORM IS BEING USED TO (cont.): (check all that apply)

☐ 8. Submit an **IRA Completion Statement.**

☐ a. Check here if future response actions addressing this Release or Threat of Release notification condition will be conducted as part of the Response Actions planned or ongoing at a Site that has already been Tier Classified under a different Release Tracking Number (RTN) . When linking RTNs, rescoring via the NRS is required if there is a reasonable likelihood that the addition of the new RTN(s) would change the classification of the site.

b. Provide Release Tracking Number of Tier Classified Site (Primary RTN): ☐ - ☐

These additional response actions must occur according to the deadlines applicable to the Primary RTN. Use the Primary RTN when making all future submittals for the site unless specifically relating to this Immediate Response Action.

☐ 9. Submit a **Revised IRA Completion Statement.**

(All sections of this transmittal form must be filled out unless otherwise noted above)

C. RELEASE OR THREAT OF RELEASE CONDITIONS THAT WARRANT IRA:

1. Identify Media Impacted and Receptors Affected: (check all that apply)

☑ a. Air ☐ b. Basement ☐ c. Critical Exposure Pathway ☑ d. Groundwater ☐ e. Residence

☐ f. Paved Surface ☐ g. Private Well ☐ h. Public Water Supply ☐ i. School ☐ j. Sediments

☑ k. Soil ☐ l. Storm Drain ☐ m. Surface Water ☐ n. Unknown ☐ o. Wetland ☐ p. Zone 2

☐ q. Others Specify: _____

2. Identify Oils and Hazardous Materials Released: (check all that apply)

☐ a. Oils ☑ b. Chlorinated Solvents ☐ c. Heavy Metals

☐ d. Others Specify: _____

_____

D. DESCRIPTION OF RESPONSE ACTIONS: (check all that apply, for volumes list cumulative amounts)

☐ 1. Assessment and/or Monitoring Only
☐ 2. Temporary Covers or Caps
☐ 3. Deployment of Absorbent or Containment Materials
☐ 4. Temporary Water Supplies
☑ 5. Structure Venting System
☐ 6. Temporary Evacuation or Relocation of Residents
☐ 7. Product or NAPL Recovery
☐ 8. Fencing and Sign Posting
☐ 9. Groundwater Treatment Systems
☐ 10. Soil Vapor Extraction
☐ 11. Bioremediation
☐ 12. Air Sparging

D. DESCRIPTION OF RESPONSE ACTIONS (cont.): (check all that apply, for volumes list cumulative amounts)

☐ 13. Excavation of Contaminated Soils

☐ a. Re-use, Recycling or Treatment ☐ i. On Site Estimated volume in cubic yards _____

☐ ii. Off Site Estimated volume in cubic yards _____

iia. Receiving Facility: _____ Town: _____ State: _____

iib. Receiving Facility: _____ Town: _____ State: _____

iii. Describe: _____

☐ b. Store ☐ i. On Site Estimated volume in cubic yards _____

☐ ii. Off Site Estimated volume in cubic yards _____

iia. Receiving Facility: _____ Town: _____ State: _____

iib. Receiving Facility: _____ Town: _____ State: _____

☐ c. Landfill

☐ i. Cover Estimated volume in cubic yards _____

Receiving Facility: _____ Town: _____ State: _____

☐ ii. Disposal Estimated volume in cubic yards _____

Receiving Facility: _____ Town: _____ State: _____

☐ 14. Removal of Drums, Tanks or Containers:

a. Describe Quantity and Amount: _____

b. Receiving Facility: _____ Town: _____ State: _____

c. Receiving Facility: _____ Town: _____ State: _____

☐ 15. Removal of Other Contaminated Media:

a. Specify Type and Volume: _____

b. Receiving Facility: _____ Town: _____ State: _____

c. Receiving Facility: _____ Town: _____ State: _____

☐ 16. Other Response Actions:

Describe: _____

☐ 17. Use of Innovative Technologies:

Describe: _____

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC105

IMMEDIATE RESPONSE ACTION (IRA) TRANSMITTAL FORM

Pursuant to 310 CMR 40.0424 - 40.0427 (Subpart D)

Release Tracking Number: 3 - 23246

E. LSP SIGNATURE AND STAMP:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and 309 CMR 4.03(2), and (iii) the provisions of 309 CMR 4.03(3), to the best of my knowledge, information and belief,

> *if Section B of this form indicates that an **Immediate Response Action Plan** is being submitted*, the response action(s) that is(are) the subject of this submittal (i) has (have) been developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is(are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> *if Section B of this form indicates that an **Imminent Hazard Evaluation** is being submitted*, this Imminent Hazard Evaluation was developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and the assessment activity(ies) undertaken to support this Imminent Hazard Evaluation comply(ies) with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000;

> *if Section B of this form indicates that an **Immediate Response Action Status Report** and/or a **Remedial Monitoring Report** is(are) being submitted*, the response action(s) that is (are) the subject of this submittal (i) is (are) being implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> *if Section B of this form indicates that an **Immediate Response Action Completion Statement** or a request to **Terminate an Active Remedial System or Response Action(s) Taken to Address an Imminent Hazard** is being submitted*, the response action(s) that is(are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is(are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal.

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

1. LSP #: 9719

2. First Name: ILEEN S 3. Last Name: GLADSTONE

4. Telephone: 7817214012 5. Ext.: 6. FAX:

7. Signature: ILEEN S GLADSTONE

8. Date: 04/26/2007 (mm/dd/yyyy)

9. LSP Stamp:

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC105

IMMEDIATE RESPONSE ACTION (IRA) TRANSMITTAL FORM

Pursuant to 310 CMR 40.0424 - 40.0427 (Subpart D)

Release Tracking Number: 3 - 23246

F. PERSON UNDERTAKING IRA:

1. Check all that apply: ☐ a. change in contact name ☐ b. change of address ☐ c. change in the person undertaking response actions
2. Name of Organization: UNIFIRST CORP
3. Contact First Name: BRIAN 4. Last Name: KEEGAN
5. Street: 68 JONSPIN RD 6. Title: ENV ENG MANAGER
7. City/Town: WILMINGTON 8. State: MA 9. ZIP Code: 01887-0000
10. Telephone: 8003477888 11. Ext.: 12. FAX:

G. RELATIONSHIP TO RELEASE OR THREAT OF RELEASE OF PERSON UNDERTAKING IRA:

☑ 1. RP or PRP ☐ a. Owner ☐ b. Operator ☐ c. Generator ☐ d. Transporter

☑ e. Other RP or PRP Specify: OTHER PRPS

☐ 2. Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s. 2)

☐ 3. Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))

☐ 4. Any Other Person Undertaking IRA Specify Relationship:

H. REQUIRED ATTACHMENT AND SUBMITTALS:

☐ 1. Check here if any Remediation Waste, generated as a result of this IRA, will be stored, treated, managed, recycled or reused at the site following submission of the IRA Completion Statement. If this box is checked, you must submit one of the following plans, along with the appropriate transmittal form.

☐ a. A Release Abatement Measure (RAM) Plan (BWSC106) ☐ b. Phase IV Remedy Implementation Plan (BWSC108)

☐ 2. Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

☑ 3. Check here to certify that the Chief Municipal Officer and the Local Board of Health were notified of the implementation of an Immediate Response Action taken to control, prevent, abate or eliminate an Imminent Hazard.

☐ 4. Check here to certify that the Chief Municipal Officer and the Local Board of Health were notified of the submittal of a Completion Statement for an Immediate Response Action taken to control, prevent, abate or eliminate an Imminent Hazard.

☐ 5. Check here if any non-updatable information provided on this form is incorrect, e.g. Release Address/Location Aid. Send corrections to the DEP Regional Office.

☑ 6. Check here to certify that the LSP Opinion containing the material facts, data, and other information is attached.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC105

IMMEDIATE RESPONSE ACTION (IRA) TRANSMITTAL FORM

Pursuant to 310 CMR 40.0424 - 40.0427 (Subpart D)

Release Tracking Number: 3 - 23246

I. CERTIFICATION OF PERSON UNDERTAKING IRA:

1. I, BRIAN KEEGAN, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

2. By: BRIAN KEEGAN (Signature) 3. Title: ENV ENG MANAGER

4. For: UNIFIRST CORP (Name of person or entity recorded in Section F) 5. Date: 04/26/2007 (mm/dd/yyyy)

☐ 6. Check here if the address of the person providing certification is different from address recorded in Section F.

7. Street: _____

8. City/Town: _____ 9. State: _____ 10. ZIP Code: _____

11. Telephone: _____ 12. Ext.: _____ 13. FAX: _____

YOU ARE SUBJECT TO AN ANNUAL COMPLIANCE ASSURANCE FEE OF UP TO $10,000 PER BILLABLE YEAR FOR THIS DISPOSAL SITE. YOU MUST LEGIBLY COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

Date Stamp (DEP USE ONLY:)

4/26/2007 4:30:27 PM

GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering

April 30, 2007
Project 04516-2

Mr. Peter Mills
Somerville City Hall
93 Highland Avenue
Somerville, MA 02145

Dear Mr. Mills:

Re: Immediate Response Action
50 Tufts Street, Somerville, MA
DEP RTNs 3-23246

On behalf of the UniFirst Corporation (UniFirst) of Wilmington, Massachusetts, GEI Consultants, Inc. is notifying your office that an Immediate Response Action (IRA) is being conducted at 50 Tufts Street (the Property) to abate an Imminent Hazard.

Chlorinated VOCs, particularly PCE, have been measured in the indoor air in the Property building. The source of the chlorinated VOCs is likely associated with the historic handling, storage, and distribution of laundry and dry cleaning chemicals at the Property. The IRA is intended to reduce the potential migration of sub-slab gases to indoor air by installing a sub-slab depressurization system (SSDS) at the Property.

This notification is made in fulfillment of the public notice requirements of the MCP (310 CMR 40.1403). If you have any questions, please contact me at 781.721.4012.

Very truly yours,

GEI CONSULTANTS, INC.

Ileen S. Gladstone, P.E., LSP
Vice President

ISG/LAL:drm

c: Massachusetts DEP - Northeast Regional Office
Brian Keegan, UniFirst Corporation

N:\04516\19.0 Reports in Progress\19.2 IRA Mod 5\cmo_boh_IRA 50 Tufts.doc

GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering

April 30, 2007
Project 04516-2

Ms. Noreen Burke
City Hall Annex - Health Department
50 Evergreen Avenue
Somerville, MA 02145

Dear Ms. Burke:

Re: Immediate Response Action
50 Tufts Street, Somerville, MA
DEP RTNs 3-23246

On behalf of the UniFirst Corporation (UniFirst) of Wilmington, Massachusetts, GEI Consultants, Inc. is notifying your office that an Immediate Response Action (IRA) is being conducted at 50 Tufts Street (the Property) to abate an Imminent Hazard.

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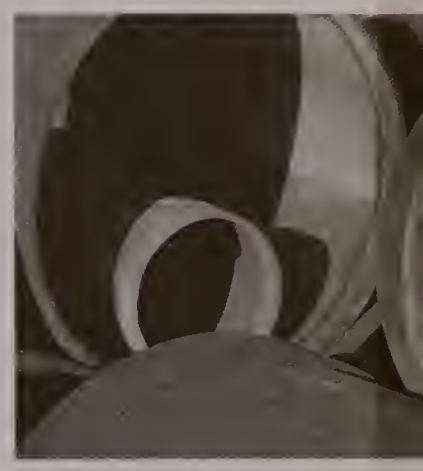
GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering



ATTACHMENT B
Design Memos

Memo

To: Ileen Gladstone, P.E., LSP

From: Jim Ash, P.E., LSP

Date: March 15, 2007

Re: 50 Tufts Street Commercial Building –Preliminary Remediation Approach and Schedule

GEI Project Number – 045162

This memorandum presents the proposed approach and schedule for remedial activities associated with the commercial building located at 50 Tufts Street, Somerville, Massachusetts. A design memorandum presenting plans and specifications of the proposed system is attached. The objective of the remediation is to control the migration of volatile organic compound (VOC) vapors from beneath the floor slab into indoor air. Specifically, the goal for future indoor air quality of the building is to achieve a condition of no Imminent Hazard for full-time commercial occupancy of the building for the contaminants of concern at the Site (i.e. chlorinated VOCs). The property owner has asked that remedial work be completed by April 30, 2007 to allow proposed occupancy of the building by a commercial automobile storage company. We are working with the property owner to obtain approval and to finalize an access agreement.

The elements of the remediation are described below; in order of their proposed implementation. Contractor availability and access agreements may delay this preliminary schedule.

- **Install sub-slab monitoring points – February 20, 2007**

  GEI coordinated the installation of 10 sub-slab vapor monitoring points in the building in late February. Three rounds of sub-slab VOC concentrations have been collected using a PID, and are shown on the attached figure. The monitoring points will be used for ongoing measurements of sub-slab vapor pressure and sub-slab air quality and provide data to support remedial design and assessment. During installation of the monitoring points, information about slab construction and sub-slab soil conditions was collected. Several monitoring points were constructed to also function as pilot-scale extraction points for sub-slab soil gas.

- **Sub-slab extraction diagnostic test, March 15-16, 2007**

  GEI will conduct an indoor diagnostic test to collect information about sub-slab air flow and vacuum distribution to support future design of sub-slab ventilation or depressurization systems. A portable vacuum will be used to extract sub-slab soil gas from selected sub-slab monitoring points. During testing, changes in sub-slab air pressure and VOC concentrations will be measured using a manometer and PID, respectively, and the air flow rate and VOC concentration of the discharge will also be measured. Up to four samples of sub-slab soil gas will also be collected and analyzed at this time.

- **Seal floor slab joints and macro-cracks – March 19-23, 2007**

  The construction joints between the perimeter and interior foundation walls and the floor slab represent a significant pathway for migration of contaminated sub-slab vapor into indoor air. We estimate that the combination of construction joints, slab expansion joints, and several prominent cracks observed in the slab represent approximately 150 to 200 square feet of exposure to sub-slab soil. The joints and cracks will be cleaned using mechanical equipment and sealed using a flexible sealant designed to fill active cracks and expansion joints.

- **Apply uniform floor coating – April 2-6, 2007**

  A floor coating system designed for concrete floors will be applied to the entire floor slab to reduce the potential migration of VOCs through micro-cracks and pores in the concrete. The coating system will likely consist of two coats of epoxy and will have a thickness of approximately 16 mil. The floor coating is designed to withstand typical wear and tear consistent with automotive storage and to have chemical resistance to typical automobile-related materials, such as gasoline, oil, and coolant.

- **Install sub-slab depressurization system – March 19-30, 2007**

  A sub-slab depressurization system will be installed to improve indoor air quality by reducing the migration rate of contaminated sub-slab vapor to indoor air while minimizing the mass of contaminants discharged to the atmosphere. The system piping is designed to allow either active or passive operation.

  We will install a temporary blower and initially operate the system in active extraction mode until elevated VOC concentrations beneath the slab attenuate to steady state conditions. The active system will serve to remove these elevated concentrations, remove residual source material in the vadose zone, if present, and allow capture and treatment of the VOCs in the discharge from the system. We will use carbon vessels to treat the off-gas initially but may convert to an alternative treatment technology depending on the results of initial operation and the anticipated duration of operation of the active system.

  We anticipate that the total VOCs removed by the system will decrease over time. The rate of the decrease will be a function of the amount of residual NAPL present, if any, and the achieved extraction rate. After the total VOC concentrations decrease and reach a steady state condition that matches the estimated VOC off-gas rate from groundwater beneath the building, we will shut down the blower and operate the system in passive mode, without off-gas treatment, for the duration of the building's use as a commercial facility. Passive mode consists of ventilation of each sub-slab piping penetration with a wind-driven rotary ventilator installed above the roofline of the building. We will test the operation of the system in passive mode to confirm that it meets the remedial goals and does not result in unacceptable discharges to ambient air. Modifications will be made to the system, including potential restoration of active operation, if the goals are not met.

- **Monitoring**

  Once the design and monitoring program are accepted by the property owner and approved by DEP, and assuming that access is provided, we will be working to start up the temporary active system in early April. For the first week of operation of the system we will monitor total VOC concentrations in the sub-slab monitoring points and in the extraction system on a daily basis using a PID. Following the start-up period, the active system will be monitored on a weekly basis, at a minimum, to confirm that system parameters such as flow rate, vacuum, and off-gas concentrations remain consistent, and to monitor potential breakthrough of the carbon vessels.

  Within one week after start-up of the system, GEI will collect up to six samples of indoor air using Summa canisters and have them analyzed by Method TO-15 for chlorinated VOCs (expedited 72-hour turnaround time). We will also collect samples from the influent and effluent from the carbon treatment system and have them analyzed by Method TO-15 for chlorinated VOCs to confirm the DEP-required 95 percent treatment efficiency. The results of the indoor air sampling will be used to confirm that the remedial goals have been met and commercial occupancy of the building is acceptable. We propose to collect indoor air samples from similar locations on a quarterly basis for one year following occupancy of the building and once annually during the winter months thereafter for the duration of the access agreement with the property owner.

  After the system is converted to passive mode, we will sample indoor air within one week after the conversion, quarterly for one year after the conversion, and once annually during the winter months thereafter for the duration of the access agreement. We will also collect samples of the off-gas from one representative vent (based on PID results) and from a downwind location using Summa canisters have them analyzed by Method TO-15.

Memo

To: Ileen Gladstone, P.E., LSP

From: Jim Ash, P.E., LSP

Date: March 15, 2007

Re: 50 Tufts Street Commercial Building –Preliminary Remediation Approach and Schedule

GEI Project Number – 045162

This memorandum presents the proposed design of a remediation system to control migration of volatile organic compound (VOC) vapors from beneath the floor slab to indoor air of the building at 50 Tufts Street, Somerville, Massachusetts. The installation of the remediation system will consist of the following components:

A) Install a sub-slab depressurization system (SSDS).

B) Fill interior slab joints and major cracks of the floor slab.

C) Seal the surface of the interior slab with an industrial floor coating.

Design details of these components are presented below and in the attached figures. Examples of equipment or materials are attached; the Contractor shall propose equivalent items in the bid document.

A. Install Sub-slab Depressurization System

- The Sub-slab Depressurization System (SSDS) will consist of 21 interior slab penetrations installed in core holes through the slab (approximately six inches thick), 2-inch schedule 80 PVC extraction piping installed below the slab, and 4-inch PVC above-slab passive exhaust piping mechanically fastened to the adjacent wall or column and extending up through the roof (lower four feet of exhaust pipe to be schedule 80, upper section shall be schedule 40). To enable active operation of the SSDS, horizontal 4-inch PVC piping will connect selected extraction points to a central location for an extraction blower and off-gas treatment. Plans showing the locations of the sub-slab extraction points, details of typical extraction points, and position of horizontal piping are attached.
- A temporary blower will be installed to operate the system in active extraction mode until elevated VOC concentrations beneath the slab attenuate to steady state conditions. Carbon vessels will be used to treat the off-gas initially, but an alternative treatment technology may be proposed. After the total VOC concentrations decrease and approach a steady state condition, the blower will be removed and the system converted to passive operation without off-gas treatment. Passive operation consists of ventilation of each sub-slab piping penetration with a wind-driven rotary ventilator installed above the roofline of the building.
- To protect interior vertical sections of exhaust piping, a spring loaded bollard will be installed near each of the three extraction points installed near interior columns. An example of a typical bollard is attached.
- The passive exhaust pipe from each extraction point will extend four feet above the roof. Each passive exhaust pipe will be fitted with a stainless steel wind-driven rotary ventilator. An example of a typical rooftop rotary ventilator is attached.
- Roof penetrations will be finished with weather-tight boots around the exhaust pipes (examples of roof flashings for pipes are attached). Prior to construction, the Contractor will confirm that the bearing capacity of the roof will enable installation of the exhaust pipes.

- The Contractor shall be responsible for disposal of all waste materials generated during construction. Waste consisting of potentially contaminated soil and concrete generated during coring of the concrete slab or installation of sub-slab extraction piping shall be placed in 55-gallon DOT-approved steel drums and not mixed with other waste materials generated during the work. The Contractor shall assume that five 55-gallon drums of potentially contaminated material will be generated during this task and require disposal. The Contractor shall arrange for the characterization and disposal of waste materials in accordance with state and federal laws.
- The Contractor shall provide all water, lighting, and electrical power necessary during construction.

B: Seal Slab Joints and Cracks

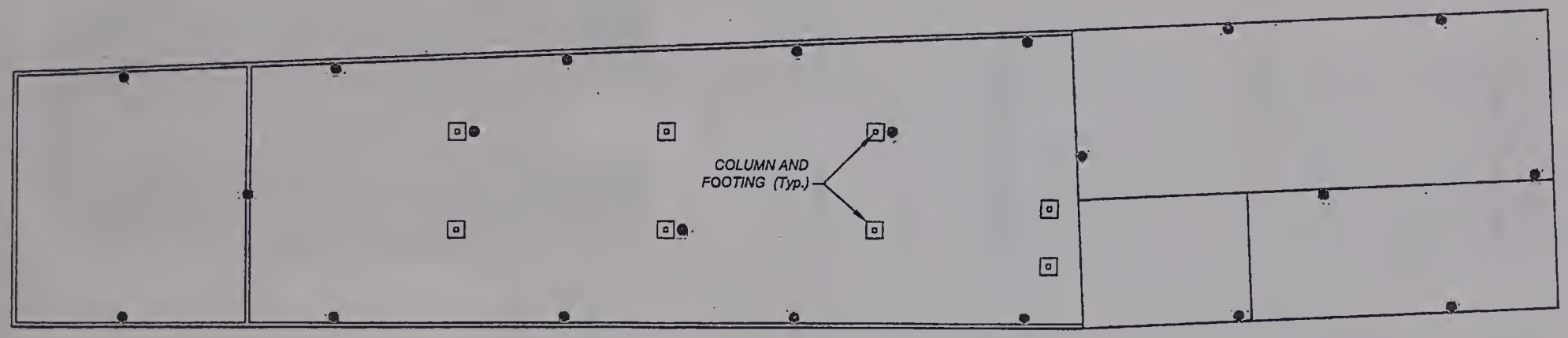
- General Pre-installation Building Preparation – During the construction and curing periods, the interior of the building shall be heated to 10 degrees F above the minimum temperature indicated by sealant manufacturer and water seepage into the building shall be prevented. The Contractor shall propose the means and methods to temporarily heat, and prevent water seepage into, the interior. The Contractor is solely responsible for preparing and maintaining interior building conditions (e.g. temperature, humidity) suitable for successful application of the sealant.
- Floor tiles in the former office room at the northeast corner of the building may contain asbestos. If they are determined to contain asbestos, they will be removed by others prior to construction.
- The interior construction joints between the slab and exterior and interior walls (typical width of approximately 1 inch), the slab expansion joints, and interior cracks in the slab which are greater than 0.125 inch wide shall be sealed. GEI estimates that the total length of these joints and cracks is approximately 2,200 linear feet. Figure 1 shows a plan of the building and location of interior and exterior walls. The Contractor shall propose a unit price per linear foot for crack and joint sealing, inclusive of surface preparation. The Contractor shall identify the cracks and joints to be sealed and obtain approval from the Engineer prior to construction.
- Use a flexible sealant designed to fill active cracks and expansion joints. The sealant must be identified in the bid document and be compatible with the floor coating materials. Provide details of material composition, ASTM test results, and physical and chemical properties.
- Prior to sealing, the joints/cracks and adjacent substrate shall be clean, dry, sound, and free of old sealant and surface contaminants (e.g. oil, grease, and foreign matter). Prepare the joints and cracks and apply the sealant in accordance with the manufacturer's specifications. At a minimum, the joints and cracks will be rout or saw-cut to provide a sound bonding surface for the sealant; dust and other particles shall be removed using oil-free compressed air. The Contractor shall submit a description of the joint/crack surface preparation and application procedure with the bid document.
- The Contractor shall be responsible for disposal of all waste materials generated during construction. Potentially-contaminated site materials and debris removed from floor joints and cracks shall be placed in 55-gallon DOT-approved steel drums and not mixed with other waste materials generated during the work. The Contractor shall assume that two 55-gallon drums of potentially contaminated material will be generated during this task and require disposal. The Contractor shall arrange for the characterization and disposal of waste materials in accordance with state and federal laws.
- The Contractor shall provide all water, lighting, and electrical power necessary during construction.

C: Seal Floor Slab

- General Pre-installation Building Preparation
- During the construction and curing periods, the interior of the building shall be heated to 10 degrees F above the minimum temperature indicated by sealant manufacturer and water seepage into the building shall be prevented. The Contractor shall propose the means and methods to temporarily heat, and prevent water seepage into, the interior. The Contractor is solely responsible for preparing and maintaining interior building conditions (e.g. temperature, humidity) suitable for successful application of the sealant.

- Floor tiles in the former office room at the northeast corner of the building may contain asbestos. If they are determined to contain asbestos, they will be removed by others prior to construction.
- The piping trench in the former office room at the northeast corner of the building shall be filled with concrete and finished to match the existing floor prior to sealing the floor slab.
- Masonry floor tiles in the utility room (adjacent to former office room) shall be removed prior to surface preparation and floor sealing.
- The interior floor slab shall be sealed to minimize soil vapor migration through the slab to indoor air. GEI estimates that the total area of the interior slab is approximately 24,000 square feet. Figure 1 shows a plan of the building.
- Use a floor coating system designed for concrete floor slabs and resistant to moderate traffic and chemicals consistent with automotive storage (e.g. engine coolant, gasoline, motor oil). The final floor coating must have a minimum thickness of 10 mil. Apply multiple coats as required to achieve the minimum thickness. The floor coating materials must be identified in the bid document and be compatible with the crack sealant materials. Provide details of material composition, ASTM test results, and physical and chemical properties.
- Prior to floor coating, the slab surface shall be clean, dry, sound, and free of surface contaminants (e.g. oil, grease, and foreign matter). Prepare the concrete and apply the coating materials in accordance with the manufacturer's specifications. At a minimum, the slab surface shall be cleaned by shotblasting (or equivalent mechanical means); dust and debris shall be removed with vacuum equipment. The Contractor shall submit a description of the floor preparation and coating application procedure with the bid document, with provisions similar to the attached example Surface Preparation Guidelines.
- The Contractor shall be responsible for disposal of all waste materials generated during construction. The Contractor shall arrange for the characterization and disposal of waste materials in accordance with state and federal laws.
- The Contractor shall provide all water, lighting, and electrical power necessary during construction.
- Unless approved by the Engineer, the Contractor shall remove all modifications made to the building to provide heat and prevent water leakage into the building.

BOSTON & MAINE RAILROAD



TUFTS STREET

0 30 60

APPROXIMATE SCALE, FEET

LEGEND:

- PROPOSED SUB-SLAB EXTRACTION POIN

NOTES:

1. FIGURE BASED ON PLAN TITLED "INTERSTATE UNIFORM ADDN., TUFTS STREET SOMERVILLE, MASS." BY STRUCTURAL SYSTEMS, INC. DATED 12-2-76.

50 Tufts Street Building
Somerville, Massachusetts

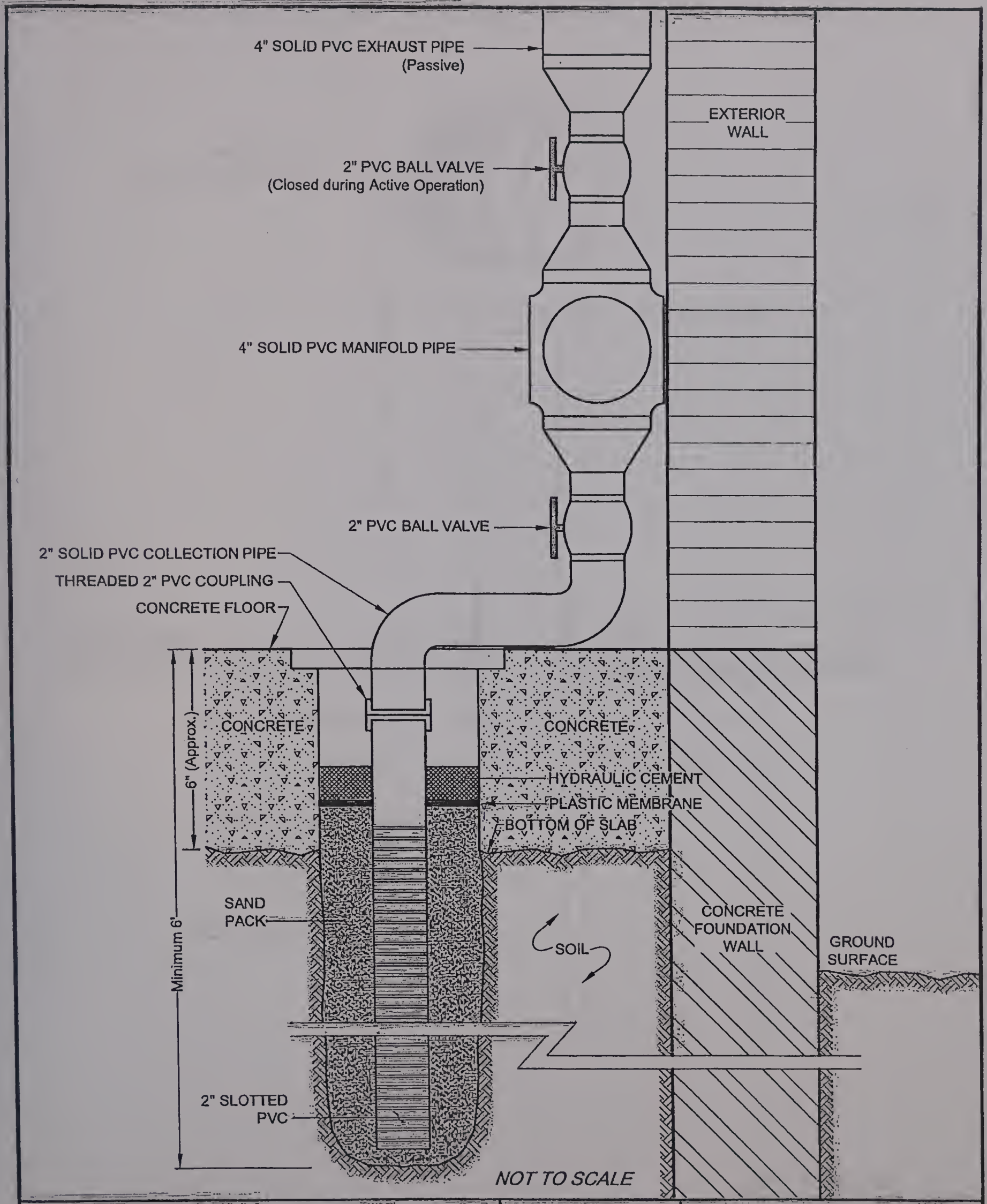
UniFirst Corporation
Wilmington, Massachusetts

GEI Consultants

PROPOSED SUB-SLAB DEPRESSURIZATION SYSTEM LAYOUT

Project 04516-2 | March 2007 | Fig. 1

N:04516-2-44 ptc 3/13/07



50 Tufts Street
Somerville, Massachusetts

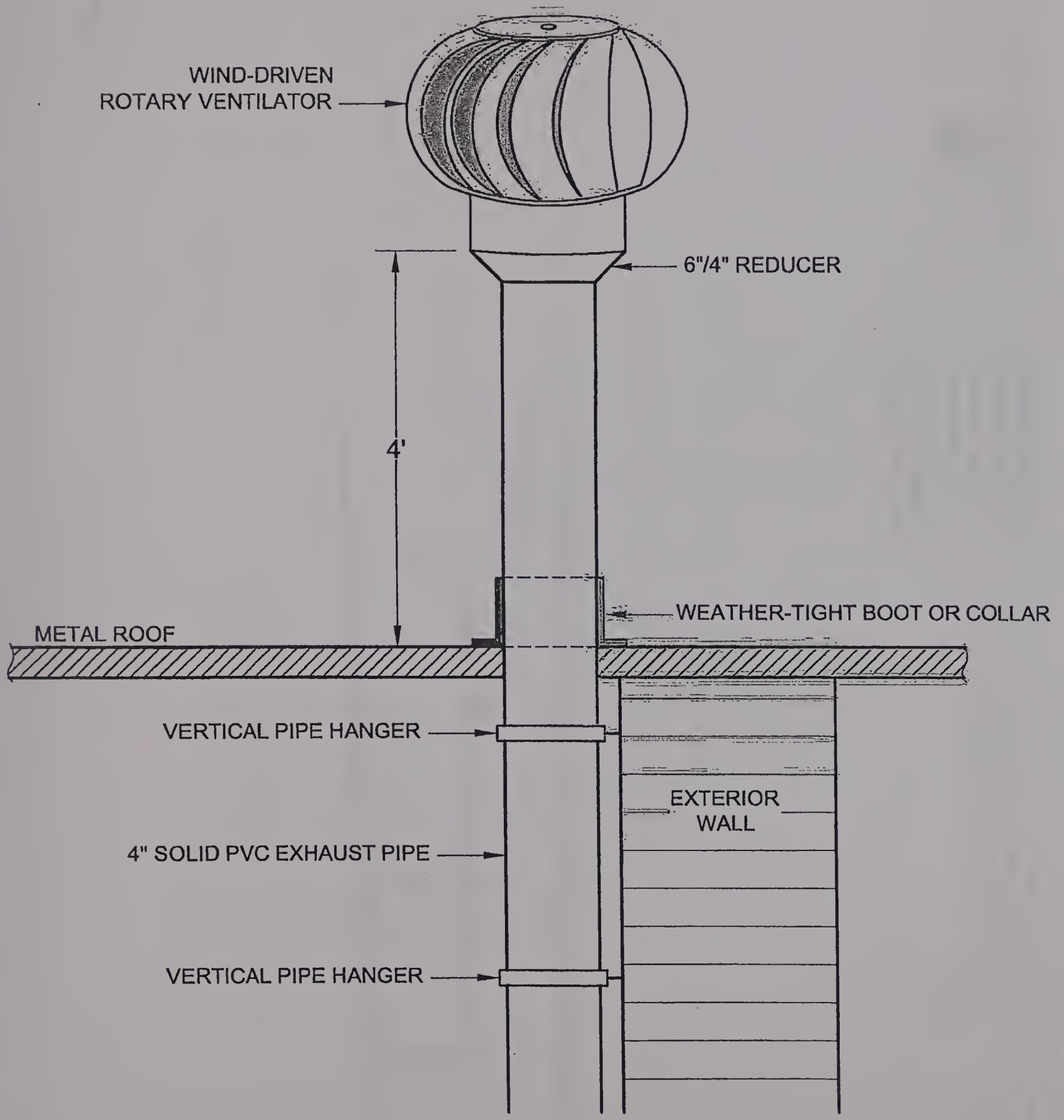
UniFirst Corporation
Wilmington, Massachusetts

GEI Consultants

PROPOSED SUB-SLAB
EXTRACTION POINT DETAIL

Project 04516-2 | March 2007 | Fig. 2

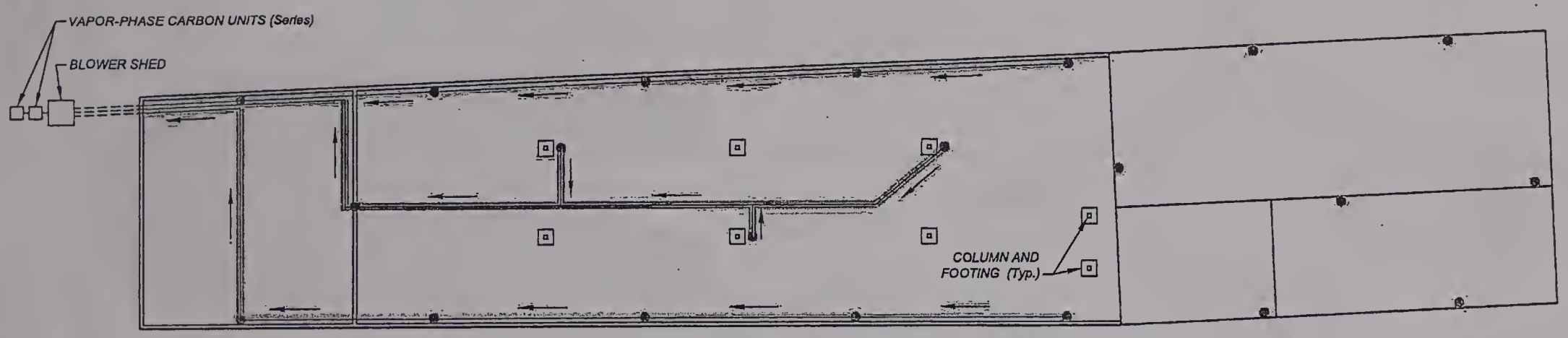
04516-2-80 ptc 3/13/07



NOT TO SCALE

50 Tufts Street Somerville, Massachusetts	GEI Consultants	PROPOSED EXHAUST PIPE PENETRATION DETAIL
UniFirst Corporation Wilmington, Massachusetts	Project 04516-2	March 2007 Fig. 3

04516-2-58 ptc 3/13/07



LEGEND:

- SUBSURFACE 4" PVC PIPE
- OVERHEAD 4" PVC PIPE
- SLAB LEVEL 4" PVC PIPE
- AIR FLOW IN ACTIVE MODE
- PROPOSED SUB-SLAB EXTRACTION POINT (4" DIA. SCHEDULE 40 PVC)

NOTES:

1. FIGURE BASED ON PLAN TITLED "INTERSTATE UNIFORM ADDN., TUFTS STREET SOMERVILLE, MASS." BY STRUCTURAL SYSTEMS, INC. DATED 12-2-76.

0 30 60

APPROXIMATE SCALE, FEET

50 Tufts Street Building
Somerville, Massachusetts

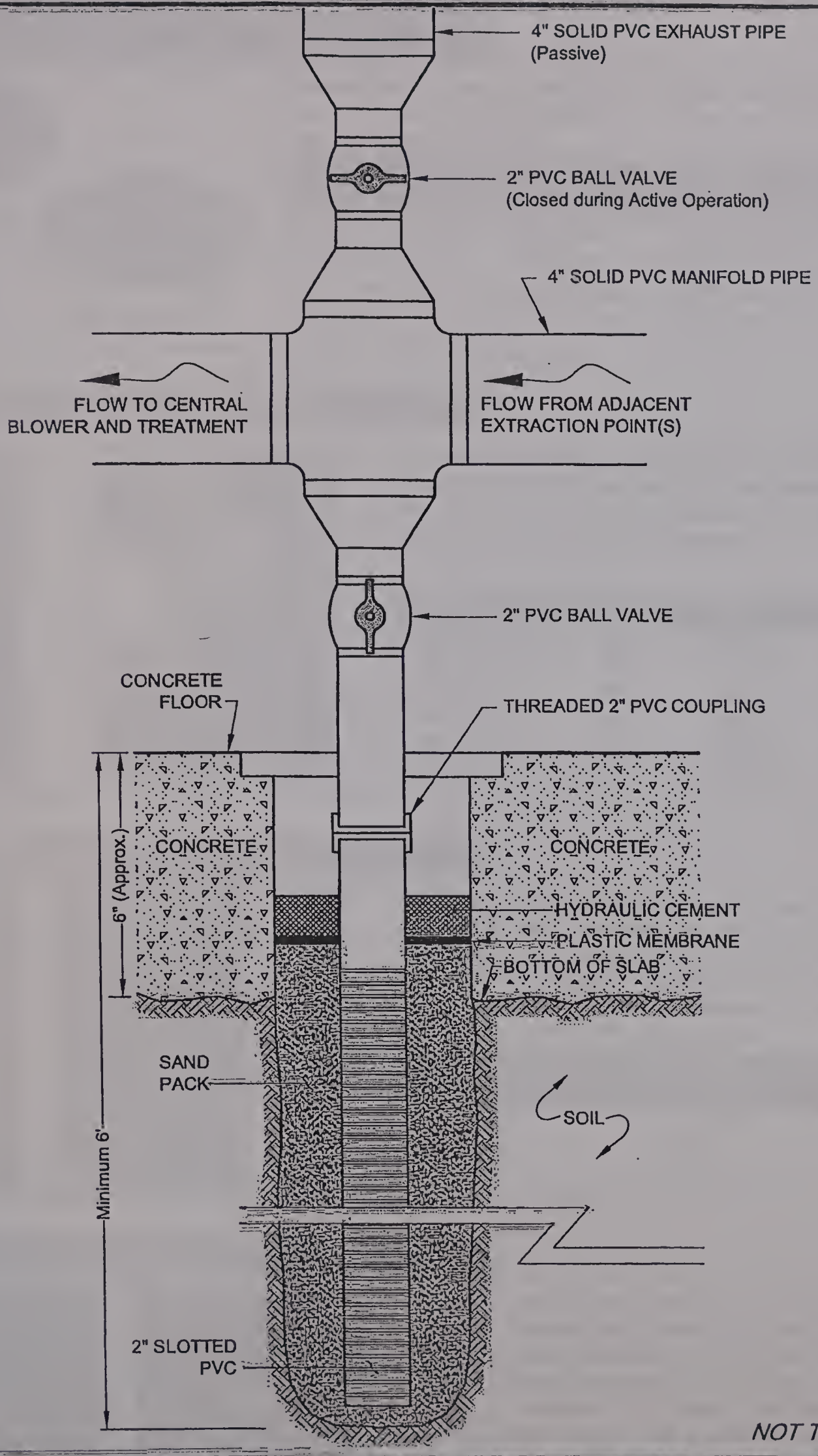
UniFirst Corporation
Wilmington, Massachusetts

GEI Consultants

ACTIVE PIPING LAYOUT FOR SUB-SLAB DEPRESSURIZATION SYSTEM

Project 04516-2 | March 2007 | Fig. 4

N: 04516-2-76 ptc 3/13/07

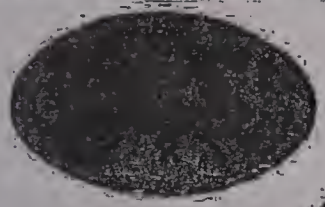


NOT TO SCALE

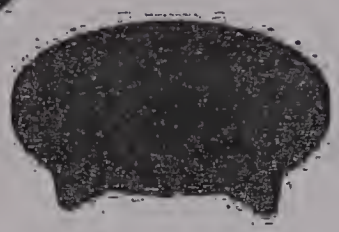
50 Tufts Street Somerville, Massachusetts	GEI Consultants	PASSIVE/ACTIVE VALVE DETAIL
UniFirst Corporation Wilmington, Massachusetts	Project 04516-2	March 2007 Fig. 5

04516-2-79 ptc 3/13/07

BOLLARD CAPS



CAST STEEL



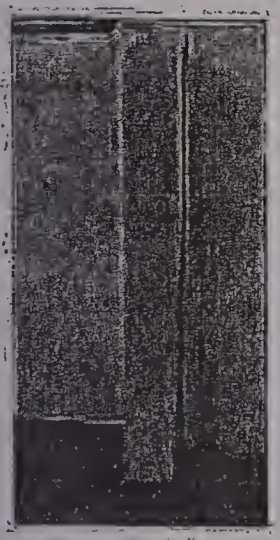
MOLDED RUBBER

Replace lost or damaged bollard caps. Available in Cast Steel or Molded Rubber. Easy to attach. Steel caps must be welded in place. Rubber cap installation is press-fit.

MODEL	MATERIAL	FITS A PIPE INNER DIAMETER	FITS MODEL
BOL-CAP-4.5-S	Cast Steel	4.26" (4" SCH. 10 Pipe)	BOL-4.5
BOL-CAP-5.5-S	Cast Steel	5.30" (5" SCH. 10 Pipe)	BOL-5.5
BOL-CAP-4.5-R	Molded Rubber	4.26" (4" SCH. 10 Pipe)	BOL-4.5
BOL-CAP-5.5-R	Molded Rubber	5.30" (5" SCH. 10 Pipe)	BOL-5.5

SERIES BOL-CAP

PLASTIC BOLLARD COVERS

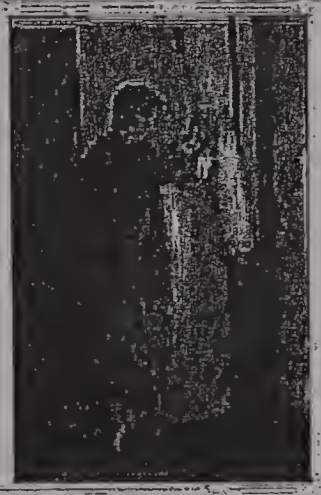


Eliminate the need for costly scraping and painting of unsightly bollards. The low density polyethylene thermoplastic molded sleeves slide over existing bollards. No hardware needed. Additional sizes and colors available.

MODEL	HEIGHT	DIAMETER	USE WITH
BPC-24-4.5	24"	4-3/4" I.D	BOL-24-4.5
BPC-24-4.5	36"	4-3/4" I.D	BOL-36-4.5
BPC-42-4.5	42"	4-3/4" I.D	BOL-42-4.5
BPC-24-5.5	24"	5-3/4" I.D	BOL-24-5.5
BPC-24-5.5	36"	5-3/4" I.D	BOL-36-5.5
BPC-42-5.5	42"	5-3/4" I.D	BOL-42-5.5

SERIES BPC

RIBBED PLASTIC BOLLARD COVER



Custom Screen Print Available

Attractive bollard sleeve is made of plastic and includes vertical ribs for an aesthetically pleasing appearance. Each sleeve includes a top cap. Two opposite sides include a flat area 2" wide to display a vertical sign if desired. Safety yellow in color. Includes installation hardware. Custom screen print, special colors and sizes are available.

MODEL	USE WITH PIPE DIAMETER	HEIGHT
BSLEE-24	4", 5", 6"	24"
BSLEE-42	4", 5", 6"	42"
BSLEE-54	4", 5", 6"	54"

SERIES BSLEE

SPRING LOADED BOLLARDS

Strobe Light & Beeper

The yellow powder coated bollard with spring loaded design alerts personnel that they are too close to the fixture being protected. A mercury switch activated warning beeper and strobe light is optional. This feature alerts the individual that they have hit the bollard and should stop. Units are 2-1/2" in diameter and stand 42" tall.

MODEL	DESCRIPTION
BSPBOL-42	Steel Pipe Bollard
BSPBOL-42-B	Steel Pipe Bollard with Beeper
BSPBOL-42-BL	Steel Pipe Bollard w/Beeper & Strobe
BSLBOL-ABK	Mounting Kit (4) 3/8" x 3" Anchor Bolts

SERIES SPBOL

ROTARY VENTILATOR

FAMCO™

This turbine vent will provide maximum CFM in all weather conditions

- ☑ A premium self lubricating bearing for lower coefficient of friction and better operating efficiency in even the slightest wind conditions.
- ☑ Bearings are swaged into place in center shaft for strength.
- ☑ Solid one piece center shaft eliminates welds for strength and stability.
- ☑ Corrugated wind vanes are engineered and positioned to capture maximum amount of air in all wind conditions.
- ☑ So well constructed internally with galvanized steel that no external bracing is required.
- ☑ Wide range of sizes available.

FAMCO™

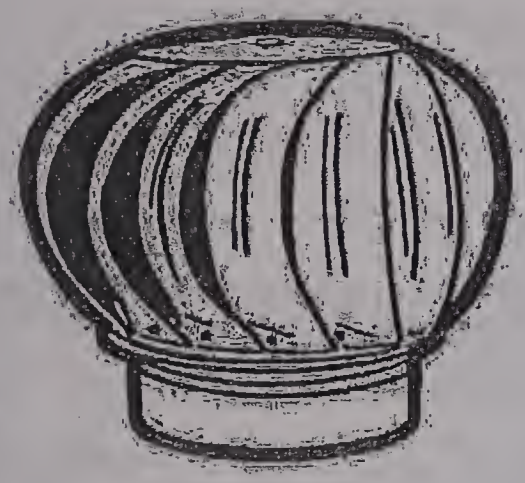
FRESH AIR MANUFACTURING CO.

Technologies in Ventilation

649 N. Ralstin St., Meridian, Idaho 83642 (208)884-8931 1-800 234-1903 Fax (208) 884-8943

ROTARY VENTILATOR

FAMCO™



NOTE: To establish required number of RV's needed for any area, first calculate the total number of cubic feet In the area to be ventilated. Then follow instructions below.

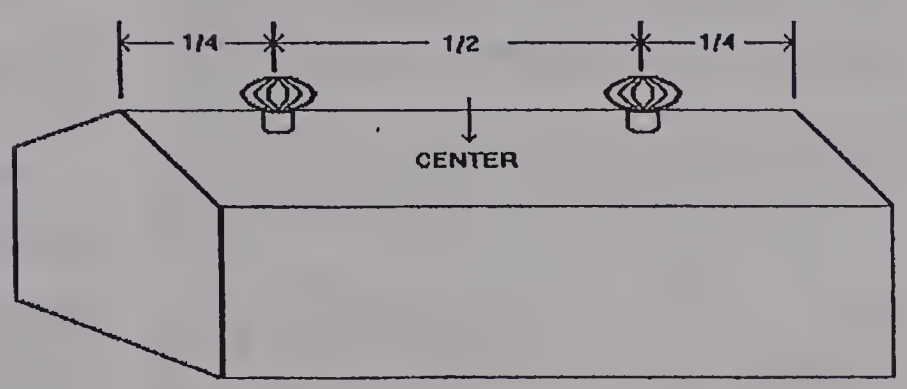
IF YOU KNOW:

REQUIRED AIR CHANGES: Divide the total cubic feet by the number of air changes required per minute. This will give you the number of CFM required to reach the correct air changes. On the CFM ratings chart at the right, find the RV that most closely reaches the correct CFM (use the lowest CFM rating so that this will be the minimum attained).

SIZE OF ROTARY REQUESTED: Divide minimum CFM rating into total cubic feet. This will tell you how many RV's are needed to totally ventilate the area each minute. (This number can then be used to calculate the number of minutes that you want a 100% air change to take place.)

RECOMMENDED PLACEMENT OF FAMCO TURBINE VENTS

For most effective ventilation, place the rotary vent near the peak of the roof with the top fully exposed to predominant winds. The turbine vent should be as close as possible to the center of the building to provide proper drafting from each section. If more than one turbine vent is needed to properly ventilate the structure, each vent should ventilate an equal portion and be placed in the center of its section. To create proper drafting there should be an air intake area equal in size to the exhaust area. This intake area should be placed lower on the building than the turbine vents to create a sweeping effect with the incoming air.



C.F.M. - RATINGS

WIND SPEED	TEMP. DIFFER.	6"	8"	10"	12"	14"	18"
4 MPH	10	81	144	224	323	440	727
	20	83	149	232	334	455	752
	30	85	149	244	352	479	793
8 MPH	10	144	257	400	576	786	1299
	20	146	261	407	686	798	1320
	30	148	264	410	591	806	1333
10 MPH	10	176	317	494	711	970	1604
	20	182	325	506	729	994	1644
	30	186	332	517	748	1016	1678

FAMCO™

FRESH AIR MANUFACTURING CO.

Technologies in Ventilation

Roof-Repair Patches

Plastic Roof-Repair Patch

This reinforced, petroleum-asphalt-based patch repairs holes and gaps in roofing, joints, and gutters. It also provides a water-repellent seal. Patch can be applied on wet (unless noted) and dry surfaces. One gallon covers 12 sq. ft. at 1/8" thick. Apply with a trowel between 40° and 122° F. Meets ASTM D4586. Color is black. *Note:* Not for use on tar roofs.

Size		Each
11-oz. Cartridge	7746T1■	$4.07
1-gal. Can	7746T3	13.65
5-gal. Can	7746T4	50.37

■ Do not apply on wet surfaces.

Heavy Duty Flexible Rubberized Roof-Repair Patch

Significantly more flexible than the Plastic Roof-Repair Patch above, this high-performance neoprene rubber patch expands up to 250%. Use it for sealing cracks, holes, and tears in roofing. It can be applied in standing water; remains flexible and watertight for many years.

One gallon covers 6 sq. ft. at 1/4" thick. Apply with a trowel between 40° and 120° F. Color is black.

Size		Each
10-oz. Cartridge	7568T51	$4.88
1-gal. Can	7568T52	37.25

Reflective Roof-Repair Patch

This elastic, water-based patch repairs and seals cracks, holes, and tears on metal, aluminum, concrete, and foam roofs. It's white to reflect the sun's rays. One gallon covers 25 sq. ft. at 1/16" thick. Apply with a trowel, brush, or roller on dry surfaces at a minimum temperature of 50° F.

Size		Each
10.5-oz. Cartridge	76405T14	$4.70
1-gal. Can	76405T16	25.42
5-gal. Can	76405T21	99.37

Roof-Repair Mesh Fabric

Repair most roofing materials with this flexible fabric. You can use it with both hot- and cold-applied asphalt patches and coatings. When used with patches and coatings, it acts as a reinforcement.

Asphalt-Coated Glass Fabric—Meets ASTM D1668-86, Type 1.

	Color	Roll Size		Each
Polyester Fabric	White	4" × 50 ft.	76405T28	$7.50
Asphalt-Coated Glass Fabric	Black	6" × 150 ft.	7574T1	11.38
Asphalt-Coated Glass Fabric	Black	36" × 150 ft.	7574T4	65.62

Roof Coatings

Bring new life to your old roof with these coatings. They not only make your roof look like new, but also act like new by restoring properties to protect your roof from the elements.

Reinforced Roof Coatings

These petroleum-asphalt-based coatings are reinforced with fiber for strength. Use them on metal, composition, built-up, and other roof materials. Apply on dry surfaces with a sprayer or brush at 40° to 104° F.

Black coating can also be used to dampproof foundation walls. One gallon covers 25 sq. ft. at 1/16" thick. Meets ASTM D4479. ***Reflective-aluminum coating*** cuts cooling costs by reflecting the sun's rays. One gallon covers 50 sq. ft. at 1/32" thick. Meets ASTM D2824, Type 3.

Size	*Black*	Each	*Reflective Aluminum*	Each
1-gal. Can	7747T28	$12.47	7747T29	$25.76
5-gal. Can	7747T31	47.09	7747T32	100.95

Heavy Duty Flexible Roof Coating and Primer

Our flexible, water-based coating and primer provide long-lasting protection. Use them on metal, concrete, and foam roofs. Apply with a brush or roller on dry surfaces only at a minimum temperature of 50° F.

Coating—Color is white for 1-gal. can. **To Order:** For 5-gal. can, please specify color: black, light gray, or white. ***Primer***—To extend coating life, use this light gray primer.

Coverage @ 1/8" Thick.	*1-gal. Cans*	Each	*5-gal. Cans*	Each
Coating 80 sq. ft.	7687T75	$28.64	7687T2	$111.27
Primer 100 sq. ft.	7687T3	34.31	7687T4	133.07

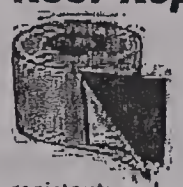
Temporary Roof-Leak Sealant

In just minutes you can make a temporary patch to quickly seal roof leaks. It works in standing water and rain—simply pour it on.

Sealant is a powder that expands into a gel on contact with water to repair cracks up to 1" wide in any flat roof. It lasts as long as the patch is kept wet and can be used in any temperature where liquid is present. One 25-lb. pail covers 50 sq. ft. at 1/2" thick. Color is gray.

25-lb. Pail ..... 7635T15 Each $30.14

All-In-One Adhesive-Backed Roof-Repair Rolls



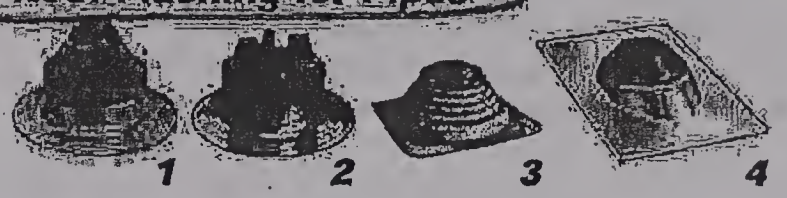
Peel off the backing and then stick in place to quickly and easily repair leaky roofs, gutters, and more. No additional coatings are required. All rolls have a rubberized, asphalt adhesive back. Choose from models with a laminated, reflective aluminum surface or a laminated, white-coated aluminum surface.

Rolls are lightweight; puncture, abrasion, and leak resistant; and reflect heat. They conform to a variety of clean, smooth, dry surfaces such as wood, metal, masonry, and existing asphalt roofs.

Rolls are 33½ ft. Lg. × 3/64" Thick. and can be easily cut to size. Apply in temperatures above 60° F.

Width	*Reflective Aluminum Surface*	Per Roll	*White-Coated Aluminum Surface*	Per Roll
4"	9640T1	$12.10	9640T4	$13.26
6"	9640T2	18.17	9640T5	19.90
36"	9640T3	98.63	9640T6	108.43

Roof Flashing for Pipes



To prevent roof leaks before they start, this flashing allows pipes that penetrate your roof to expand, contract, and vibrate without disturbing the watertight seal.

1-3 For Single-Ply, Built-Up, and Corrugated-Metal Roofs—Use this flashing for air conditioning, heating, and exhaust-system pipes. All styles have a rubber cap and an aluminum base. The rubber portion can be cut to fit each pipe OD size listed below. Each includes one stainless steel clamp (unless noted). Temperature range is −60° to +270° F.

(1&2) Flashing for single-ply and built-up roofs has a black EPDM rubber cap with a double-groove connection that mates to the round aluminum base.

(3) Flashing for corrugated-metal roofs is made of one-piece EPDM molded gray rubber with a 1" wide aluminum flanged base that bends to any contour.

4 For Shingle Roofs—Use this flashing for plumbing vent pipes as well as two-walled, air-insulated vent pipes (also known as Type B roof vents). It has a black elastomeric collar that easily slides over pipes and a 24-gauge, galvanized steel base. This flashing fits 40° pitched roofs and is rated for 180° F continuous heat.

No.	For No. of Pipes	Fits Pipe OD Range	Flange Size	O'all Ht.		Each
For Single-Ply and Built-Up Roofs						
1	1	2"-6"	14" Dia.	8"	7503T1	$71.61
2	4	(2) 3/8"-1"; (2) 1"-2"	14" Dia.	6½"	7503T2★	71.61
For Corrugated-Metal Roofs						
3	1	1/4"-4"	8" × 8"	4"	7503T3	28.55
3	1	4"- 7"	11" × 11"	5"	7503T4	35.28
3	1	7"-13"	17" × 17"	6"	7503T5	88.23
For Shingle Roofs						
4	1	1¼"–1½"	8½" × 12½"	2½"	2390K41	6.77
4	1	2"	8½" × 12½"	2½"	2390K42	7.15
4	1	3"	10¾" × 14½"	2½"	2390K43	7.79
4	1	4"	12" × 15⅜"	3¼"	2390K44	10.09

★ Includes four clamps.

Roof-Coating Brush

Applying roof-repair patches and coatings is not a problem for this heavy duty brush. It has 3¼" long tampico fiber bristles securely attached to a 6¼" × 1¾" hardwood block and a 1⅛" dia., 54" long, tapered wood handle.

7233T2 ..... Each $13.43

Roof-Shingle Remover

Made of steel, the blade is notched and has a heavy duty pivoting point welded on the back for excellent shingle-lifting leverage. The blade measures 6⅞" Wd. × 12" Ht. and has a 1½" dia., 48" long, straight wood handle.

6321A12 ..... Each $30.54

PERFORMANCE FLOORING SOLUTIONS
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SURFACE PREPARATION GUIDELINES

DUR-A-FLEX, INC. has developed this document to help Facility Owners, Architects, Engineers, Specification Writers, and Contractors gain a better understanding of the importance of a properly prepared substrate, and the methods to achieve an appropriate bond. Each year millions of dollars are spent on good coating systems that fail due to inadequate surface preparation or improper application. Much of this can be prevented with proper evaluation, specification, and control of these two vital factors.

The intent of this document is to offer some basic guidelines that will help you get the best possible return on your flooring investment. The information presented has been accumulated from technical reports and publications, as well as DUR-A-FLEX research and experience in this field.

There are many satisfactory methods of preparing a substrate to receive a DUR-A-FLEX flooring system. The preparation method is typically chosen based on:

1.) **Service requirements.** The more aggressive the environment, the more the "bond line" will be challenged. i.e. harsh/moderate/light service.
2.) **Time allowed for entire process.** Production rates vary tremendously. Time constraints alone may dictate which method is most appropriate.
3.) **Budget/Cost.** Large jobs can often provide "economies of scale" which may dictate which method is most appropriate.
4.) **Available power.** Certain surface preparation equipment requires high voltage three-phase power.
5.) **Accessibility.** Certain surface preparation equipment may be too large or heavy to be used in certain situations.

PERSONAL PROTECTION EQUIPMENT

Most surface preparation and application operations require the use of appropriate personal protection equipment. It is the responsibility of the surface preparation contractor and the flooring contractor to insure that all personnel are properly protected from hazards. DUR-A-FLEX is committed to promoting awareness regarding these potential hazards. All DUR-A-FLEX products are rated according to the Hazardous Material Identification System (HMIS). Containers are clearly marked with this information. OSHA regulations specify when, where and how workers are to be protected. These regulations and the local OSHA officials should be consulted as necessary to insure proper protection, compliance with the law, and to avoid liability issues. Container labels and Material Safety Data Sheets should always be read and understood prior to starting. Safety and health issues should be addressed prior to the start the job.

PREPARATION EFFECTS PERFORMANCE

Coating performance depends on adequate surface preparation and proper application. Many guide specifications now incorporate detailed surface preparation and application instructions in recognition of this fact. This guide is designed as a basic reference for adequate surface preparation, and as an aid in selecting the proper type of surface preparation for a particular substrate or service condition.

COST OF SURFACE PREPARATION

The most substantial cost of a coating is not the product itself, but the cost associated with the surface preparation and application of the coating system. It is estimated that labor costs will continue to increase faster than materials and the difference between the two will, therefore, become even greater. These cost factors further underscore the advisability of evaluating, specifying and controlling the surface preparation and application on every coating project where high performance and long-term protection are expected.

METHODS OF SURFACE PREPARATION

Care should be taken to define the degree of abrasion required for the coating system so that the concrete will not be eroded beyond what is necessary. All concrete surfaces should be abraded to remove laitance and contaminants. Creation of a concrete profile is required to achieve mechanical bond. The ideal profile is 10 to 20 mils (similar to 60 grit sandpaper). This is defined by measuring the average distance from the peaks to the valleys in a cross section view of the concrete. For coating applications less than 40 mils thick, a milder profile may be desired. Rougher profiles with thin film floor systems will be visually detectable and may be objectionable.

ASTM D 4259 - 83

Standard practice for abrading concrete.

1. This practice includes surface preparation of concrete to prepare the surface prior to the application of coatings.
2. This practice is intended to alter the surface profile of the concrete.

Shotblasting has become the preferred method of surface preparation for most polymer floor installations. It is suitable for concrete, steel and tile substrates. Shotblast equipment utilizes an alloy wheel spinning at high speeds to throw small steel particles at the substrate in a controlled, dry, 99% dust-free operation. This process removes surface contamination, adds profile and vacuums the concrete clean in one process. The size and angularity of shot, along with the travel speed of the unit, can be adjusted to determine the degree of the surface profile. Because shotblasting is a dry preparation process, it allows the installation to begin immediately after completion of prep (surface must be dry before blasting). Shotblasting will also identify weak areas in the surface of the concrete (i.e. concrete pours that were rained on, or poorly finished concrete). **NOTE:** When selecting shotblast preparation for thin film coating systems (under 20 mils) be aware that a blast pattern or track lines will be visible. Acid etching may be the preferred method for large-scale thin film coating systems.

Mechanical Abrasion preparation consists of the use of mechanical tools and equipment designed to abrade or chip away the surface of the concrete. Common types available include Scarifiers, Scabblers, Grinders, Planers and Bush Hammers. These tools are typically electrically or pneumatically driven power tools that are noisy and create a lot of dust. Be sure to address noise and dust control, if Mechanical Abrasive preparation is to be utilized.

Dust-Free Diamond Grinders have become quite popular because of their ability to remove multiple contaminants quickly. Like shotblasting, this process is dust-free and dry.

ASTM D 4260 - 83

Standard practice for acid etching concrete.

1. This practice includes surface preparation of concrete to prepare the surface prior to the application of coatings.
2. This practice is intended to alter the surface profile of the concrete.

Acid Etching is a process where the concrete surface is chemically etched using a 10-30% solution of hydrochloric or muriatic acid. When it is applied to the floor it will begin to foam due to its reaction with the free lime and laitence in the concrete. This reaction will actually profile the concrete allowing for the mechanical bond of the resinous flooring. *Acid Etching* will not work properly over a film forming curing compound, sealer or a surface that is contaminated with oils, wax, or grease. These contaminants must be removed by other Mechanical Abrasive means. *Acid Etching* is a wet process, requiring a thorough rinsing and neutralization with clean water after the initial reaction is complete. Drying time must also be taken into consideration.
NOTE: "PRE-WET" floor before etching and do not allow acid to dry on surface. Apply acid to concrete surface with a flower watering can. Sprinkle acid evenly over the entire area to be coated at the rate of 100 Sq Ft per gallon. Allow to froth for a few minutes then scrub with a stiff broom or mechanical scrubber. Use a wet/dry vac to recover spent acid. Follow the same procedure two to three times with tap water to neutralize the residual acid.

NOTE: Make sure to properly dispose of used acid according to state and local laws.

TESTING

Moisture Testing

The presence of excessive moisture in or below concrete slabs can lead to both short-term installation problems as well as long-term adhesion problems with seamless resinous floors. Water vapor will travel through concrete from an area of high humidity to low humidity. This vapor transmission, when trapped under a seamless resinous floor, will build up vapor pressure and may eventually cause blistering or delamination of the seamless floor. This same vapor drive leaving a concrete slab may cause the resinous materials, while in their liquid state, to bubble and blister. All slabs should be checked for moisture content prior to installation of seamless flooring. There are two methods used for the detection of moisture in concrete. Please refer to the **"Moisture Guidelines"** document for more information.

Method 1 - **ASTM-D 4263 Standard Test Method for Indicating Moisture in Concrete** by the Plastic Sheet Method. This test is conducted by taping down a sheet of glass or minimum 6 mil polyethylene, approximately 18"x18", to the concrete surface for a period of not less than 24 hours. After removal of the sheet, check for the presence of moisture. One test area is required per 500 square feet of floor.

Method **2** - **Calcium Chloride Crystal Test** - This test was developed by the Rubber Manufacturers' Association to make either a quantitative or qualitative evaluation of vapor emissions from the concrete. The recommended frequency is one test per every 1000 square feet of floor.

Unfortunately, neither of these methods is 100% conclusive since they only quantify a certain spot at a specific point in time.

Testing For An Existing Sealer

Test to see if the floor is "sealed" by pouring a small amount of muriatic acid or DUR-A-FLEX CAC (Concrete Acid Cleaner/Etch) on the floor in several

spots. If it "froths" instantly, the floor is not sealed. If the acid doesn't froth immediately, a sealer and/or paint is present and must be removed by scarifying, steel shot blasting or other mechanical methods.

Salt Contamination Testing

Salt contaminated slabs that contain steel reinforcement are very susceptible to corrosion of the reinforcing steel. As this steel corrodes it expands causing cracking, delamination of concrete and any toppings bonded to it, and eventually structural failure of the slab. Obvious signs of chloride or salt contamination are spalled concrete with exposed, rusted reinforcing steel. Testing is recommended to determine the depth of contamination and the extent of corrosion activity. A Litmus Test will determine the pH of concrete, which will attest to the presence of chloride or acid contamination, if the pH is below 10.

Acid contamination

Acid contamination in concrete, like salt, lowers the pH thus increasing the potential for electrochemical corrosion activity. In addition, acids can attack and break down the cement paste that binds the aggregates in concrete. Contaminated slabs that are covered with a polymer flooring system often experience failure at the bond line due to residual acid attack. Moisture vapor transmission actually activates residual acids at the bond line. The acid attack on the cement eventually weakens this bond line, causing delamination of the polymer flooring system.

Oil Based Contamination

Oil Based contaminants tend to migrate in concrete through the capillary channels. Oils and animal fats will inhibit the bond of any adhered surface treatment. A common household heat lamp can be used to determine the presence of oil-based substances at or near the surface. The heat lamp should be focused on the concrete at a distance of 2 feet for a period of 8 hours. The presence of these substances on the surface would indicate contamination.

Bond Test

The purpose of the BOND TEST is to make sure the preparation is adequate for the primer to bond to the substrate. For epoxy systems this is not common due to lengthy cure time. For MMA systems this is a quick and easy procedure that uses the CRYL-A-PRIME P-101, with or without the CRYL-A-BOND additive, Q-11 sand and CRYL-A-CURE (BPO). With a stir stick or a margin trowel, apply this mix in ¼" to ½" thick, 3" to 4" diameter patties on the substrate. Allow to cure for 1 hour and remove with a hammer and chisel.

The procedure is as follows:

Pour 6 to 8 ounces of primer in a paper/plastic cup. Add 1or 2 tablespoons of CRYL-A-CURE (BPO) and stir mix for 15 to 30 seconds. Add enough Q-11 (1 1/2 times the volume of resin) to achieve very WET slurry. Note: If this mix is too dry it will not leave enough primer to soak into the substrate. Excessive liquid on the surface when you stop mixing is a good indication that the mix is appropriately "wet".

Place "patties" of this mixture on the substrate. Do not just pour the mix out, because the first patties will be very wet and the last patty will be too dry.

Allow to cure about 1 hour. The material is fully cured when it has cooled to substrate temperature. Remove with a hammer and chisel. Look at the bottom of the patty. You should have removed 1/8" to 1/2" inch of concrete. If there is nothing or only laitance, this is an indication that further preparation is probably necessary.

REMOVAL AND REPAIR

ASTM D 4258 - 83 Standard practice for surface cleaning concrete for coating. This practice includes surface cleaning of concrete to remove grease, dirt, and loose material prior to the application of coatings. Procedures include broom cleaning, vacuum cleaning, air blast cleaning, water cleaning, detergent water cleaning, and steam cleaning.

Removal of bond inhibiting contaminants

This includes, but is not limited to removal of oils, grease, wax, sealers, curing compounds, laitanence, salts and any other hydrocarbon based materials. This will ensure that a good bond takes place between the resinous flooring and the concrete substrate.

Removal of Adhesives, Mastics and Membranes

In many retrofit projects, existing tile, VCT or sheet goods are being replaced with polymer flooring systems. Removal of the floor finish will often leave a layer of some type of mastic, adhesive or membrane. In thin applications these materials can often be totally cleaned up by shotblasting the concrete. In thicker applications, the steel shot will tend to bounce, requiring additional preparation with the use of scarifying equipment or possibly even the use of chemical strippers. Wherever possible, consult the DUR-A-FLEX Tech Service Department or your local DUR-A-FLEX Flooring Contractor and schedule a site visit to investigate the best removal methods. On bid projects it is often better to bid the demolition and removal of adhesives as a separate item. Identifying the quantity and location of these areas will help assure that proper surface preparation is performed.

Removal of Existing Seamless Floor
Like mastics and adhesives, the need to remove an existing seamless floor will occasionally arise. There has been much progress made in the development of equipment for removal of resurfacers. Typically, removal requires a heavy grinder with "rotating heads". These heads can be outfitted with different "teeth" or carbide "blades" for removal of a particular type of overlay.

TYPES OF SUBSTRATES

Regular Concrete surface must be prepared with a steel shot-blast machine, scarifier, dust-free diamond grinder or DUR-A-FLEX CAC. Follow directions on label and/or CAC Product Data Sheet. Floors with oil, grime and grease should first be cleaned with DUR-A-FLEX HI-SPEED Cleaner/Degreaser before etching. Allow floor to dry. Good ventilation, fans and/or auxiliary heat will accelerate drying time. Do not use oil fired portable heaters.

Replacement of Structurally Deteriorated Concrete must be done in accordance with The International Concrete Repair Institute (ICRI) Bulletin. **Surface Preparation** for the Repair of Deteriorated Concrete Polymer flooring systems cannot perform when applied over weak, deteriorated, punky concrete. Flash patch or gypsum based patching cements is not acceptable. Patching material must be a DUR-A-FLEX Epoxy or MMA based polymer concrete or a polymer modified cement repair mortar engineered for the type of concrete deficiency being repaired. Make sure manufacturer specifies minimum cure time before installation of resinous flooring, as well as verifies compatibility with superceding coatings and/or overlays. DUR-A-FLEX FLOORING Contractors should be contracted whenever possible to complete these repairs appropriately.

Fiber Filled Concrete must be burned with a weed burner, swept and vacuumed perfectly clean and then primed. When primer has completely cured, the floor must be sanded and tack ragged (This step may not be necessary for thick resurfacing systems).

Quarry/Ceramic tile have been successfully resurfaced on many projects without removal of tile and setting bed. A site investigation along with cores through the entire slab will help identify the type of setting bed, the existence of any waterproofing membranes, additional toppings, or other unusual existing conditions. Water trapped within the floor will create long-term sanitation and performance problems.

If the tile is well bonded and placed over an unsaturated latex setting bed, the floor may be resurfaced as follows: Surface must be mechanically abraded with a steel shot-blast machine, scarifier or diamond grinder, and vacuumed perfectly clean. "Tack rag" area to remove dust and soften surface. Apply DUR-A-FLEX recommended Epoxy or MMA primer to entire area immediately and allow to cure.

Existing Epoxy Coating/Resurfacer - Existing seamless floors may be resealed or resurfaced from time to time due to excessive wear or the need to change the appearance or skid-resistance of the floor. The existing floor should first be cleaned and degreased with a mild detergent. It must then be mechanically abraded with a floor-sanding machine or a steel shot blast machine to totally remove gloss. Vacuum perfectly clean. "Tack rag" area to remove dust and soften surface. Apply DUR-A-GLAZE TIE-COAT to entire area immediately.

Plywood - must be new, clean, tongue and groove, smooth finish (NO KNOTS), and at least 3/4" thick. Plywood should be positively fastened to existing surface with a high quality construction adhesive as well as a 6" screw pattern. For epoxy, all joints must be filled with a mixture of ELAST-O-COAT 100% solids epoxy and NO SAG #1. Embed fiberglass joint tape into wet epoxy. For MMA applications, substrate flex will dictate the amount of reinforcement required. For "light" loads the plywood joint may be covered with a 4" to 6" wide layer of ¾ ounce fiberglass mat. For "heavy" loads the entire substrate must be covered with a ¾" fiberglass mat.

Steel – must be shotblasted to near white (SSPC10). Primer must be applied within 4 hours of preparation or before oxidation begins.

Walls:

Block: apply Dulux (ICI) block filler to fill pores. Follow manufacturers instructions.

Drywall: must be finished to a level #4 or #5 finish prior to coating. Substrate will affect final appearance of wall coating.

Cast in place Concrete: fill pores and cracks with compatible material to achieve desired smoothness.

CRACKS AND JOINTS

Evaluate and assess cracks and joints prior to installation to determine which cracks are non-moving and which cracks are moving.

Non-Moving joints can be filled with DUR-A-GLAZE #4 and Flintshot, and then "buried" with successive coats or layers.

Moving Joints typically need to be "honored". The seamless coating or resurfacer can be temporarily applied right over these cracks and joints. After cure is complete these are sawcut and then filled with ELAST-O-COAT or DUR-A-FILLER.

Memo

To: Ileen Gladstone, P.E., LSP

From: Jim Ash, P.E., LSP

Date: April 16, 2007

Re: 50 Tufts Street Commercial Building –Addendum to Remediation Design of SSDS

GEI Project Number – 045162

This memorandum presents an addendum to the remedial design for the sub-slab depressurization system (SSDS) currently under construction at the commercial building located at 50 Tufts Street, Somerville, Massachusetts. This memorandum provides:

- A summary of the SSDS diagnostic tests we conducted from March 24 through 28 to evaluate the proposed spacing of the extraction points inside the building and mechanical system requirements;
- Details of the proposed active SSDS components (e.g. blower, carbon, etc.);
- A summary of minor modifications made to the system piping and floor coating inside the building during construction; and
- Proposed operation and monitoring activities for the blower and off-gas treatment system.

As described in our previous submittals to you, the objective of the remediation is to control the migration of volatile organic compound (VOC) vapors from beneath the floor slab into indoor air. Specifically, the goal for future indoor air quality of the building is to achieve a condition of no Imminent Hazard for full-time commercial occupancy of the building for the contaminants of concern at the Site (i.e. chlorinated VOCs). The property owner has asked that we use best efforts to complete remedial work by April 30, 2007.

Much of the work inside the building is complete, including the SSDS extraction points, interior piping, and crack sealing of the floor slab. Due to the poor condition of the roof, and despite extensive efforts to patch holes and divert rain water with tarps, our contractor cannot make the building water tight. This is delaying the shot blasting and floor coating work. It cannot be undertaken until weather forecasts indicate several days without precipitation. We anticipate installing the proposed active system components within the next two weeks and to start up the active system before April 30, 2007, weather permitting. We have previously notified the building owner and its consultants of the problems and delays that the failing roof is causing on this project.

- **Sub-slab extraction diagnostic tests, March 24-28, 2007**

  We conducted a series of indoor diagnostic tests to collect information about sub-slab VOC concentrations and vacuum distribution to support the design of the sub-slab depressurization system. Figure 1 (attached) shows the locations of the extraction and monitoring points. These tests were conducted before the cracks and joints in the floor slab in the vicinity of the test were sealed.

  We used a 6.5 horsepower portable vacuum to extract sub-slab soil gas from two representative sub-slab extraction points (labeled EP-A and EP-B). Flexible plastic hose was used to connect the various components of the test system. The gas from the sub-slab extraction point passed through a drum filled with 200 pounds of granular activated carbon (GAC) to remove VOCs prior to entering the portable vacuum. A dilution bypass valve installed between the GAC drum outlet and portable vacuum was used to control the vacuum applied to the extraction point. The treated off-gas was then discharged inside the warehouse building. The VOC concentration of the treated discharge was

measured periodically with a photoionizatoin detector (PID) and there was no indication of carbon breakthrough. A second 200-pound GAC drum was maintained on-site during the test in case the first GAC drum was insufficient for off-gas treatment.

A total of five tests were conducted:

1. March 24: extraction from point EP-B using -23.5 inches of water column (W.C.) pressure (measured at the extraction point).
2. March 24: extraction from point EP-B using -2.5 inches W.C.
3. March 24: extraction from point EP-A using -23.5 inches W.C.
4. March 24: extraction from point EP-A using -3.5 inches W.C.
5. March 24 to 28: extraction from point EP-A using -10.0 inches W.C.

Before starting the first test, we measured sub-slab air pressure and VOC concentrations using a digital manometer and PID, respectively. Results of the pre-test measurements are presented in Table 1 (attached). During each test, we measured the sub-slab air pressure at nearby monitoring points, which included SS2 through SS6, and the potential extraction points EP-A, EP-B, and EP-C (point EP-C was not used for active extraction during the tests). Results of test measurements are presented in Table 1. At the end of fifth test on March 28, we reduced the extraction vacuum to 2.0 inches W.C. and collected a sub-slab soil gas sample using a Summa canister and submitted the sample to Accutest Laboratories for analysis using method TO-15. A copy of the laboratory data report for the analytical results is attached. The result of the PID measurement of the sub-slab soil gas at the extraction point just prior to collecting the sub-slab soil gas sample was 85 parts-per-million by volume (ppmV), compared to 112 ppmV of total VOCs reported for the laboratory sample.

The results of the diagnostic tests showed a radius of influence of approximately 30 to 50 feet at extraction vacuums of 2.5 to 23.5 inches W.C. Plots of the sub-slab vacuum versus distance from the active extraction point are attached. Data for monitoring point SS5 are not shown on the plots and were not used to estimate radius of influence because the point was located adjacent to a significant slab crack which affected the results. That crack has since been sealed as part of the remedial construction work. Based on the results of these tests, the proposed spacing of the extraction points approximately 50 feet apart is appropriate and will provide overlapping vacuum influence areas when all extraction points are operating.

- **Sub-slab depressurization system – mechanical system components**

  The system piping is designed to allow either active or passive operation. However, we will install a temporary blower and initially operate the system in active extraction mode until elevated VOC concentrations beneath the slab attenuate to steady state conditions. The active system will serve to remove these elevated concentrations, remove residual source material in the vadose zone, if present, and allow capture and treatment of the VOCs in the discharge from the system. We will use carbon vessels to treat the off-gas initially but may convert to an alternative treatment technology depending on the results of initial operation and the anticipated duration of operation of the active system.

  The mechanical system components will consist of:

  - Control valves on each of the three header pipes connected to the 22 extraction points.
  - Skid-mounted Nash Elmo 15 horsepower regenerative blower, gauges and controls
  - 40-gallon water separator and high-level switch.
  - Two 2,000 pound vapor phase activated carbon adsorbers, in series (model Vent-Scrub 2000).

  Figure 2 (attached) shows the approximate location of the system and manufacturer's diagrams of the system components are attached. The system will be housed in a temporary enclosure near the southwestern corner of the building and initially operated 24 hours per day.

We anticipate that the total VOCs removed by the system will decrease over time. The rate of the decrease will be a function of the amount of residual source material present, if any, and the achieved extraction rate. After the total VOC concentrations decrease and reach a steady state condition that matches the estimated VOC off-gas rate from groundwater beneath the building, we will shut down the blower and operate the system in passive mode, without off-gas treatment, for the duration of the building's use as a commercial facility. Passive mode consists of ventilation of each sub-slab piping penetration with a wind-driven rotary ventilator installed (subject to municipal permit approvals) above the roofline of the building. We will test the operation of the system in passive mode to confirm that it meets the remedial goals and does not result in unacceptable discharges to ambient air. Modifications will be made to the system, including potential restoration of active operation, if the goals are not met.

- **Interior piping and floor coating design modifications**

The design modifications were made in response to conditions encountered at the building during our pilot testing and initial installation work. They do not affect the basic approach or goals for the system.

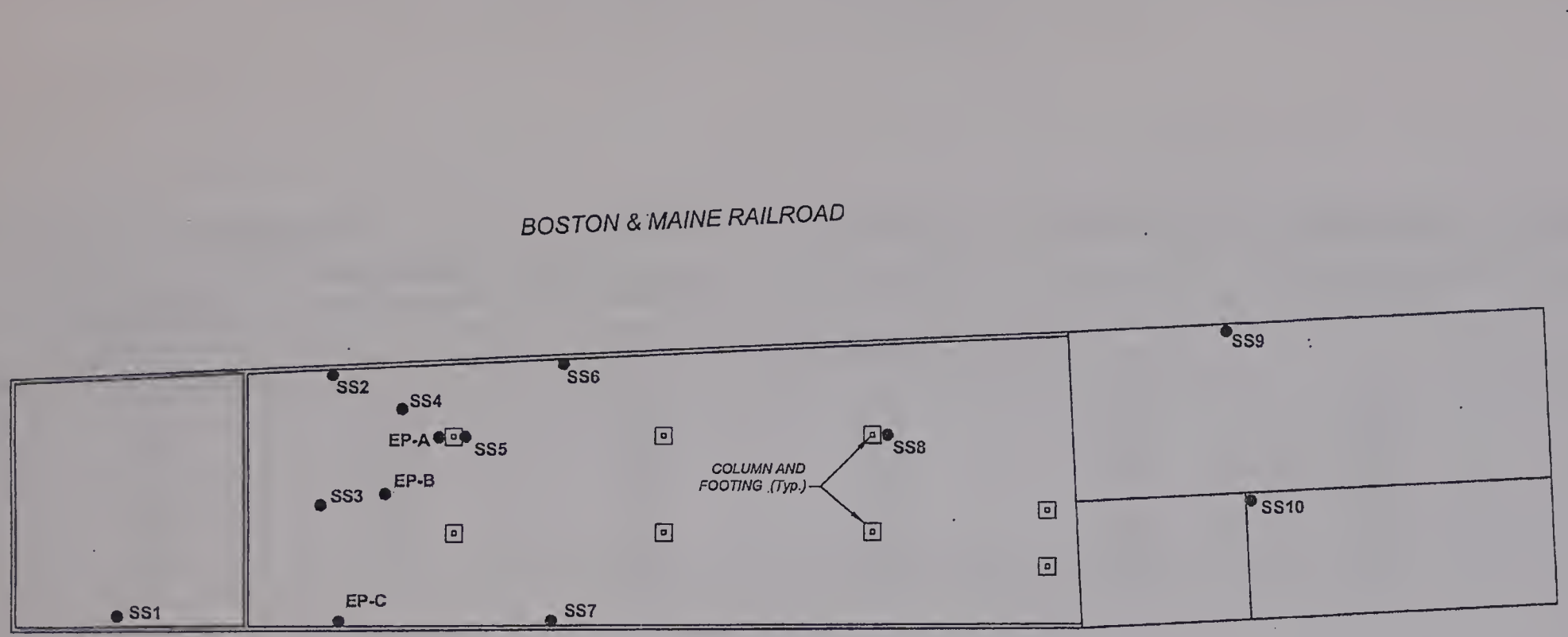
The Contractor selected for this work initially proposed two coats of Sikagard 62 to meet the design criteria of 10 mil minimum thickness. The two coats would have a combined thickness of 16 mil. After observing the condition of the slab and the moisture issues associated with the failing roof, the contractor has proposed replacing the first coat with Sikafloor 90, a higher viscosity epoxy that will penetrate more thoroughly into concrete pores and microcracks and create a stronger bond than the Sikagard 62. The resulting coating thickness may be 1 to 2 mil less than the 16-mil thickness originally proposed. However, it is GEI's opinion that the modified coating system is appropriate and justified. A Sikafloor 90 product sheet is attached.

The SSDS piping design has been modified to include connections to all sub-slab extraction points in the building, including those in the northern portion of the building (i.e. northern warehouse area, office room, and utility room). The extraction points in the northern portion of the building were originally proposed to be constructed solely as passive vents. Elevated VOC conditions were encountered during installation of these points indicating that initial active vapor extraction may be appropriate. The piping from the three extraction points in the office and utility rooms extends to the exposed roof trusses and connects to the extended manifold piping that runs overhead along the center of the warehouse space to the proposed blower location near the southwest corner of the building. The manifold piping on the western wall of the building was extended to connect to extraction points in the northern warehouse area. The modified piping layout is shown in Figure 2 (attached).

- **Monitoring**

The monitoring plan for indoor air in the building was provided in our March 13, 2007 preliminary design memorandum. This section provides details regarding the proposed monitoring plan for the extraction system. For the first week of operation of the system, we will monitor total VOC concentrations in the extraction system influent, between the carbon adsorbers and from the exhaust stack on a daily basis using a PID. Following the initial start-up period, the active system will be monitored on a weekly basis for the first month and monthly thereafter, at a minimum, to confirm that system parameters such as flow rate, vacuum, and off-gas concentrations remain consistent, and to monitor potential breakthrough of the carbon vessels. We will also collect samples from the influent and effluent from the carbon treatment system and have them analyzed by Method TO-15 for chlorinated VOCs to confirm the DEP-required 95 percent treatment efficiency and to confirm that the discharge concentrations are within acceptable limits. In accordance with DEP Policy #WSC-94-150, these samples will be collected 1, 7, 14, and 28 days after system startup. Off-gas treatment analysis will continue monthly thereafter using a PID.

After the system is converted to passive mode, we will sample off-gas from one representative vent (based on PID results) and from a downwind location using Summa canisters and have them analyzed by Method TO-15. This data will be used to confirm that the discharge from the passive vents is within acceptable limits (less than 100 pounds per year and no unacceptable exposures to downwind receptors).



NOTES:

1. FIGURE BASED ON PLAN TITLED "INTERSTATE UNIFORM ADDN., TUFTS STREET SOMERVILLE, MASS." BY STRUCTURAL SYSTEMS, INC. DATED 12-2-76.

LEGEND:

- SUB-SLAB SOIL GAS MONITORING POINT
- SUB-SLAB SOIL GAS EXTRACTION POINT

0 30 60

APPROXIMATE SCALE, FEET

50 Tufts Street Building Somerville, Massachusetts	GEI Consultants
UniFirst Corporation Wilmington, Massachusetts	SUB-SLAB SOIL GAS MONITORING POINT LOCATIONS
Project 04516-2	April 2007 Fig. 1

N:04516-2-49r ljw/pto 3/13/07

Table 1
Results of Sub-slab Extraction Pilot Tests - March 2007
50 Tufts Street
Somerville, MA

	Pre-Test (3/24/07)		Test 1 (3/24/07)	Test 2 (3/24/07)	Test 3 (3/24/07)	Test 4 (3/24/07)	Test 5 (3/26/07)
	Pre-test sub-slab VOC measurements	Pre-test sub-slab pressure measurements	EP-B vaccum of 23.5 inches water column	EP-B vaccum of 2.5 inches water column	EP-A vaccum of 23.5 inches water column	EP-A vaccum of 3.5 inches water column	EP-A vaccum of 10 inches water column
Monitoring Point ID	Sub-slab VOC concentration (ppmV)	Sub-slab Air Pressure (inches water column)					
SS2	334	0.000	NM	0.000	-0.003	0.000	0.000
SS3	81	0.000	-0.378	-0.035	-0.121	-0.013	-0.031
SS4	233	0.000	-0.221	-0.020	-1.671	-0.334	-0.701
SS5	8	0.000	0.000	0.000	-0.028	-0.004	-0.006
SS6	9	0.000	0.000	NM	NM	0.000	0.000
EP-A	NM	NM	-0.037	0.000	-23.5	-3.5	-10.0
EP-B	>1,000	NM	-23.5	-2.5	-0.128	-0.028	-0.040
EP-C	NM	NM	-0.005	0.000	0.000	0.000	0.000

Note:
VOC = Volatile Organic Compounds
ppmV = parts-per-million by volume
VOC measurements conducted with photoionization detector equipped with a 10.6 eV lamp.
For pressure readings which fluctuated during measurement, the mid-range value is presented here.
NM = Not measured.

Report of Analysis

Client Sample ID:	PILOT - INFLUENT		
Lab Sample ID:	M63733-1	Date Sampled:	03/28/07
Matrix:	AIR - Air Summa ID: D005,M072	Date Received:	03/29/07
Method:	TO-15	Percent Solids:	n/a
Project:	Indoor & Outdoor Air Samples Tufts St., Somerville MA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	J9882.D	20	04/02/07	PB	n/a	n/a	MSJ511
Run #2	Q3123.D	10000	04/03/07	DFT	n/a	n/a	MSQ167

	Initial Volume
Run #1	400 ml
Run #2	400 ml

CAS No.	MW	Compound	Result	RL	Units	Q	Result	RL	Units
67-64-1	58.08	Acetone	7.9	10	ppbv	J	19	24	ug/m3
106-99-0	54.09	1,3-Butadiene	ND	10	ppbv		ND	22	ug/m3
71-43-2	78.11	Benzene	9.1	10	ppbv	J	29	32	ug/m3
75-27-4	163.8	Bromodichloromethane	ND	10	ppbv		ND	67	ug/m3
75-25-2	252.8	Bromoform	ND	10	ppbv		ND	100	ug/m3
74-83-9	94.94	Bromomethane	ND	10	ppbv		ND	39	ug/m3
593-60-2	106.9	Bromoethene	ND	10	ppbv		ND	44	ug/m3
100-44-7	126	Benzyl Chloride	ND	10	ppbv		ND	52	ug/m3
75-15-0	76.14	Carbon disulfide	ND	10	ppbv		ND	31	ug/m3
108-90-7	112.6	Chlorobenzene	ND	10	ppbv		ND	46	ug/m3
75-00-3	64.52	Chloroethane	ND	4.0	ppbv		ND	11	ug/m3
67-66-3	119.4	Chloroform	19.5	10	ppbv		95.2	49	ug/m3
74-87-3	50.49	Chloromethane	ND	10	ppbv		ND	21	ug/m3
107-05-1	76.53	3-Chloropropene	ND	10	ppbv		ND	31	ug/m3
95-49-8	126.6	2-Chlorotoluene	ND	10	ppbv		ND	52	ug/m3
56-23-5	153.8	Carbon tetrachloride	ND	4.0	ppbv		ND	25	ug/m3
110-82-7	84.16	Cyclohexane	ND	10	ppbv		ND	34	ug/m3
75-34-3	98.96	1,1-Dichloroethane	5.3	4.0	ppbv		21	16	ug/m3
75-35-4	96.94	1,1-Dichloroethylene	ND	4.0	ppbv		ND	16	ug/m3
106-93-4	187.9	1,2-Dibromoethane	ND	10	ppbv		ND	77	ug/m3
107-06-2	98.96	1,2-Dichloroethane	ND	4.0	ppbv		ND	16	ug/m3
78-87-5	113	1,2-Dichloropropane	ND	10	ppbv		ND	46	ug/m3
123-91-1	88	1,4-Dioxane	ND	10	ppbv		ND	36	ug/m3
75-71-8	120.9	Dichlorodifluoromethane	141	10	ppbv		697	49	ug/m3
124-48-1	208.3	Dibromochloromethane	ND	10	ppbv		ND	85	ug/m3
156-60-5	96.94	trans-1,2-Dichloroethylene	ND	4.0	ppbv		ND	16	ug/m3
156-59-2	96.94	cis-1,2-Dichloroethylene	10.6	4.0	ppbv		42.0	16	ug/m3
10061-01-5	111	cis-1,3-Dichloropropene	ND	10	ppbv		ND	45	ug/m3
541-73-1	147	m-Dichlorobenzene	ND	10	ppbv		ND	60	ug/m3
95-50-1	147	o-Dichlorobenzene	ND	10	ppbv		ND	60	ug/m3
106-46-7	147	p-Dichlorobenzene	ND	10	ppbv		ND	60	ug/m3
10061-02-6	111	trans-1,3-Dichloropropene	ND	10	ppbv		ND	45	ug/m3

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	PILOT - INFLUENT		
Lab Sample ID:	M63733-1	Date Sampled:	03/28/07
Matrix:	AIR - Air Summa ID: D005,M072	Date Received:	03/29/07
Method:	TO-15	Percent Solids:	n/a
Project:	Indoor & Outdoor Air Samples Tufts St., Somerville MA		

CAS No.	MW	Compound	Result	RL	Units	Q	Result	RL	Units
64-17-5	46	Ethanol	ND	10	ppbv		ND	19	ug/m3
100-41-4	106.2	Ethylbenzene	ND	10	ppbv		ND	43	ug/m3
141-78-6	88	Ethyl Acetate	ND	10	ppbv		ND	36	ug/m3
622-96-8	120.2	4-Ethyltoluene	ND	10	ppbv		ND	49	ug/m3
76-13-1	187.4	Freon 113	ND	10	ppbv		ND	77	ug/m3
76-14-2	170.9	Freon 114	ND	10	ppbv		ND	70	ug/m3
142-82-5	100.2	Heptane	ND	10	ppbv		ND	41	ug/m3
87-68-3	260.8	Hexachlorobutadiene	ND	10	ppbv		ND	110	ug/m3
110-54-3	86.17	Hexane	ND	10	ppbv		ND	35	ug/m3
591-78-6	100	2-Hexanone	ND	10	ppbv		ND	41	ug/m3
98-82-8	120	Isopropylbenzene	ND	10	ppbv		ND	49	ug/m3
67-63-0	60	Isopropyl Alcohol	ND	10	ppbv		ND	25	ug/m3
75-09-2	84.94	Methylene chloride	ND	10	ppbv		ND	35	ug/m3
78-93-3	72.11	Methyl ethyl ketone	38.6	10	ppbv		114	29	ug/m3
108-10-1	100.2	Methyl Isobutyl Ketone	ND	10	ppbv		ND	41	ug/m3
1634-04-4	88.15	Methyl Tert Butyl Ether	ND	10	ppbv		ND	36	ug/m3
111-84-2	128.2	Nonane	ND	10	ppbv		ND	52	ug/m3
109-66-0	72	Pentane	ND	10	ppbv		ND	29	ug/m3
115-07-1	42	Propylene	213	10	ppbv		366	17	ug/m3
100-42-5	104.1	Styrene	ND	10	ppbv		ND	43	ug/m3
71-55-6	133.4	1,1,1-Trichloroethane	87.2	4.0	ppbv		476	22	ug/m3
79-34-5	167.9	1,1,2,2-Tetrachloroethane	ND	4.0	ppbv		ND	27	ug/m3
79-00-5	133.4	1,1,2-Trichloroethane	ND	4.0	ppbv		ND	22	ug/m3
120-82-1	181.5	1,2,4-Trichlorobenzene	ND	10	ppbv		ND	74	ug/m3
95-63-6	120.2	1,2,4-Trimethylbenzene	ND	10	ppbv		ND	49	ug/m3
108-67-8	120.2	1,3,5-Trimethylbenzene	ND	10	ppbv		ND	49	ug/m3
540-84-1	114.2	2,2,4-Trimethylpentane	ND	10	ppbv		ND	47	ug/m3
75-65-0	74.12	Tertiary Butyl Alcohol	ND	10	ppbv		ND	30	ug/m3
127-18-4	165.8	Tetrachloroethylene	111000 [a]	5000	ppbv		753000 [a]	34000	ug/m3
109-99-9	72	Tetrahydrofuran	24.2	10	ppbv		71.3	29	ug/m3
108-88-3	92.14	Toluene	ND	10	ppbv		ND	38	ug/m3
79-01-6	131.4	Trichloroethylene	442	4.0	ppbv		2380	21	ug/m3
75-69-4	137.4	Trichlorofluoromethane	51.5	10	ppbv		289	56	ug/m3
75-01-4	62.5	Vinyl chloride	ND	4.0	ppbv		ND	10	ug/m3
108-05-4	86	Vinyl Acetate	ND	10	ppbv		ND	35	ug/m3
	106.2	m,p-Xylene	ND	10	ppbv		ND	43	ug/m3
95-47-6	106.2	o-Xylene	ND	10	ppbv		ND	43	ug/m3
1330-20-7	106.2	Xylenes (total)	ND	10	ppbv		ND	43	ug/m3

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	PILOT - INFLUENT		
Lab Sample ID:	M63733-1	**Date Sampled:**	03/28/07
Matrix:	AIR - Air Summa ID: D005,M072	**Date Received:**	03/29/07
Method:	TO-15	**Percent Solids:**	n/a
Project:	Indoor & Outdoor Air Samples Tufts St., Somerville MA		

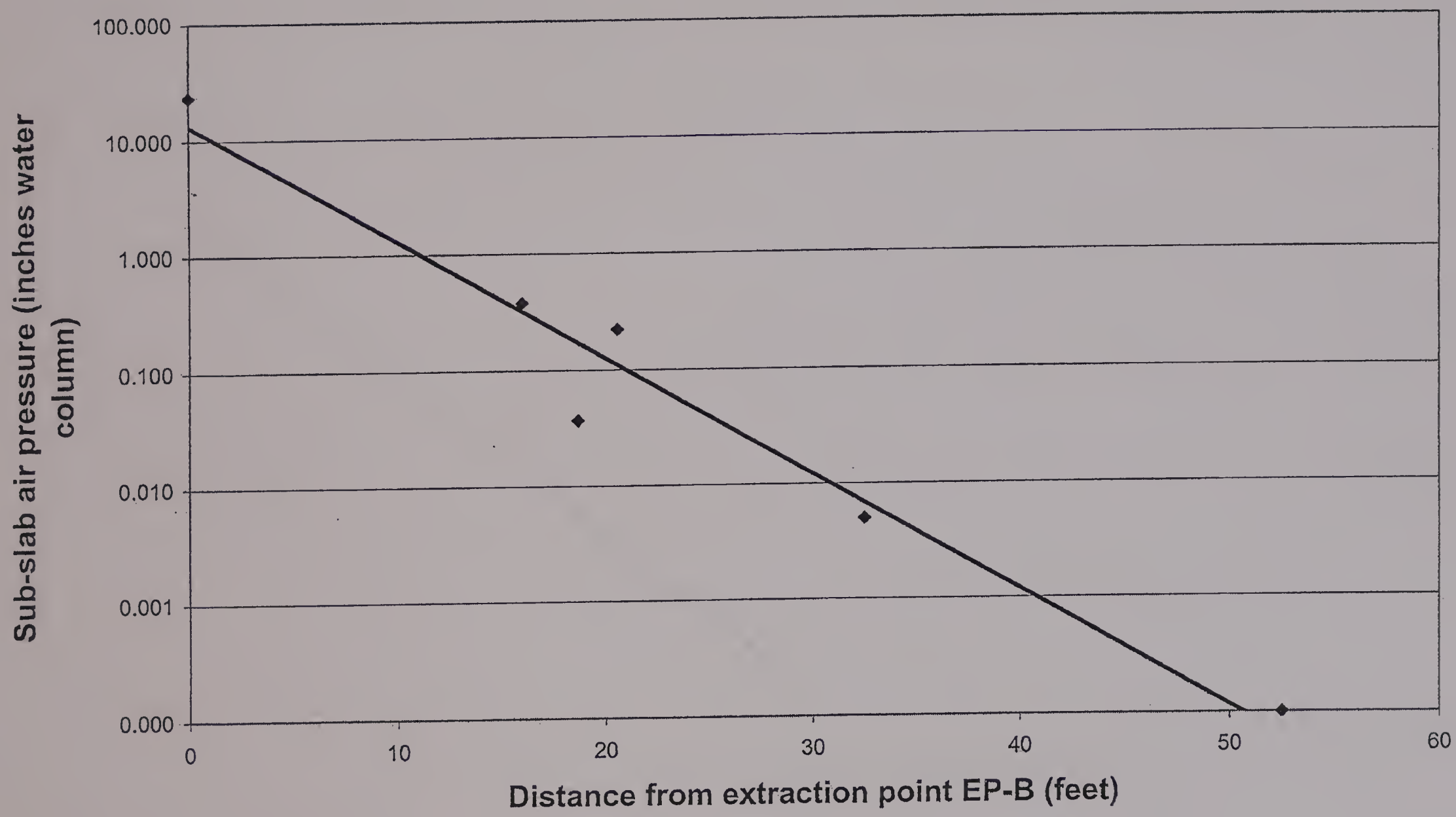
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	4-Bromofluorobenzene	83%	84%	57-139%

(a) Result is from Run# 2

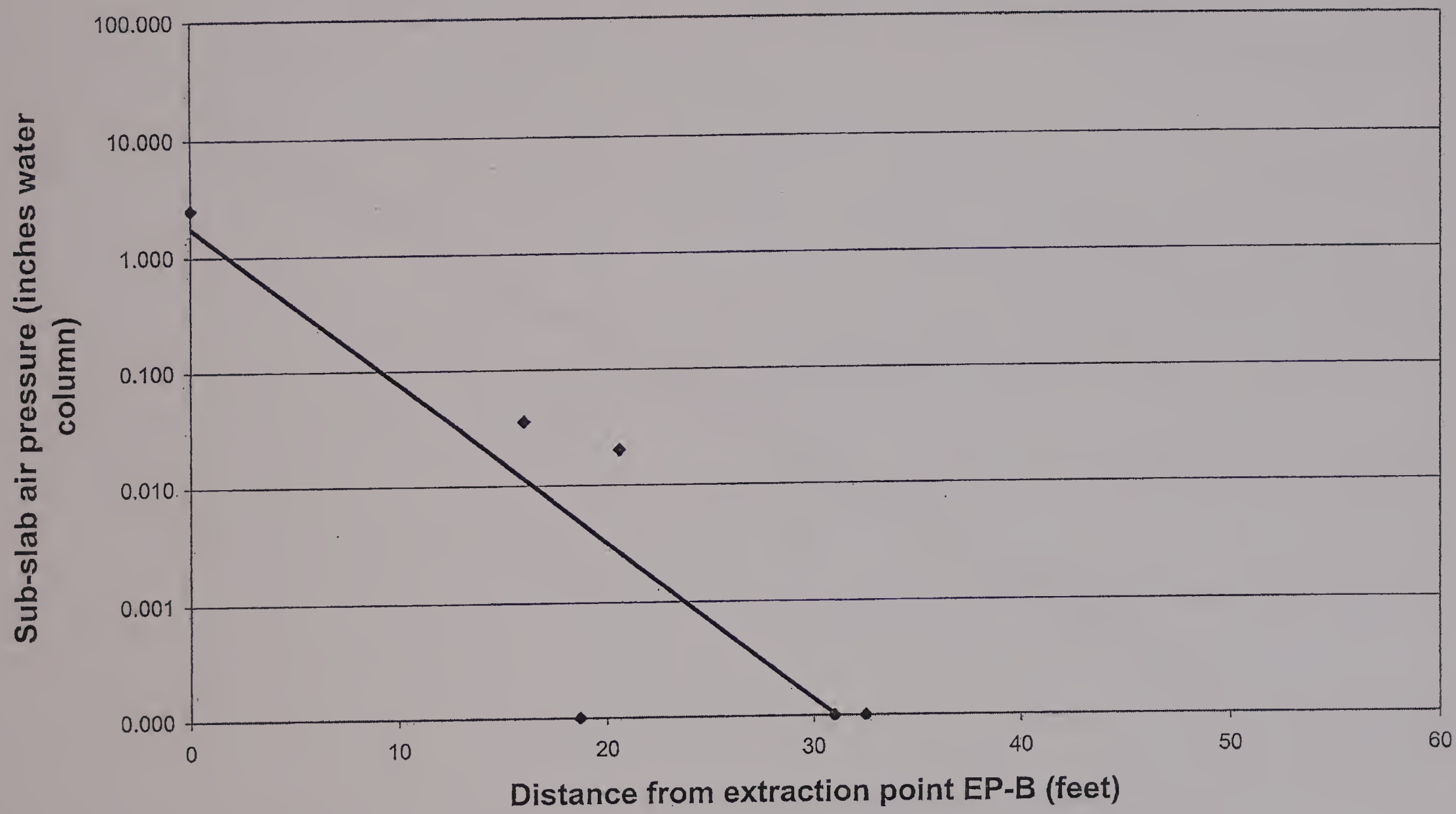
ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

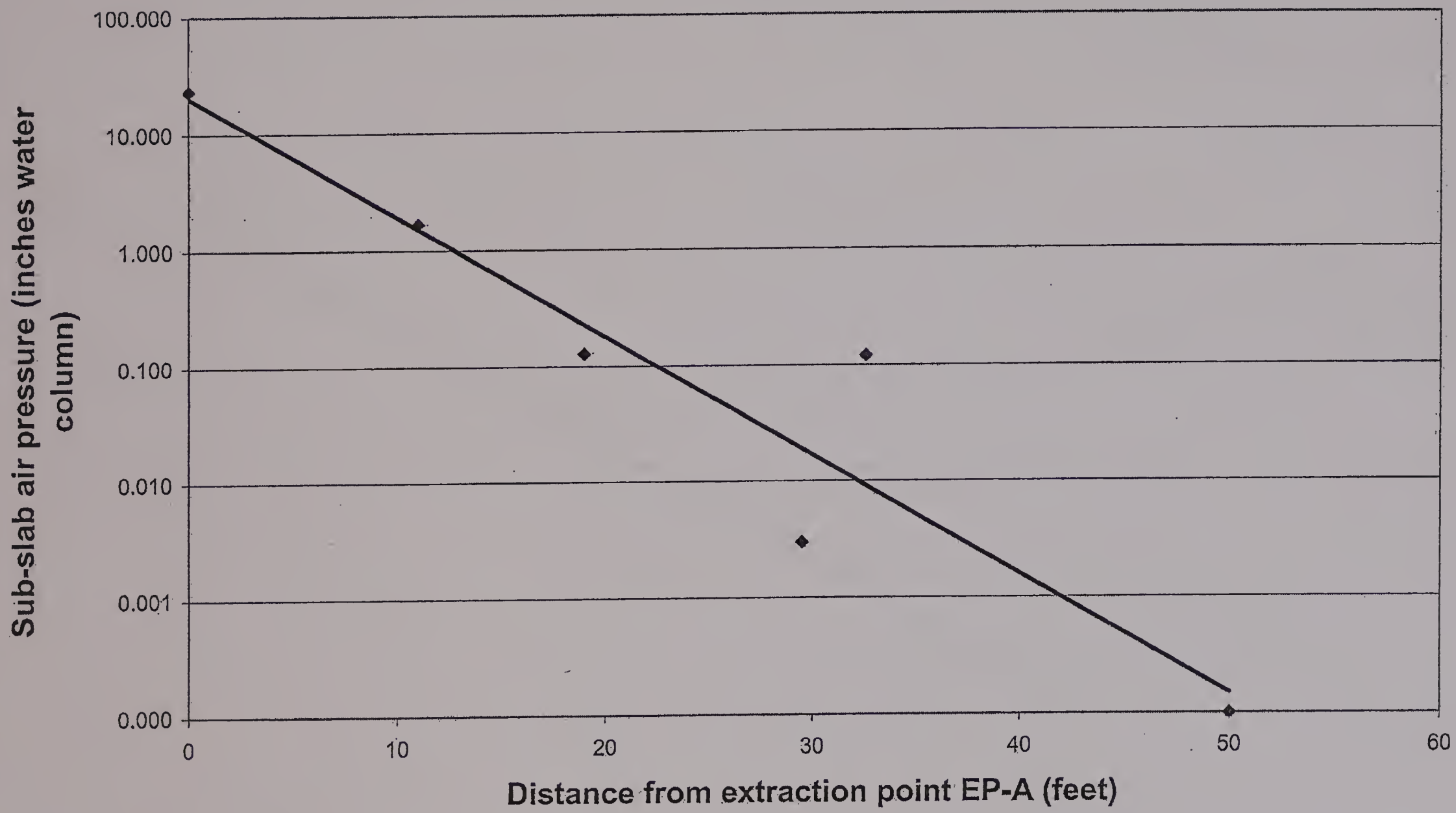
50 Tufts Street : Extraction Pilot Tests
Extraction from EP-B at 23.5 inches water vacuum



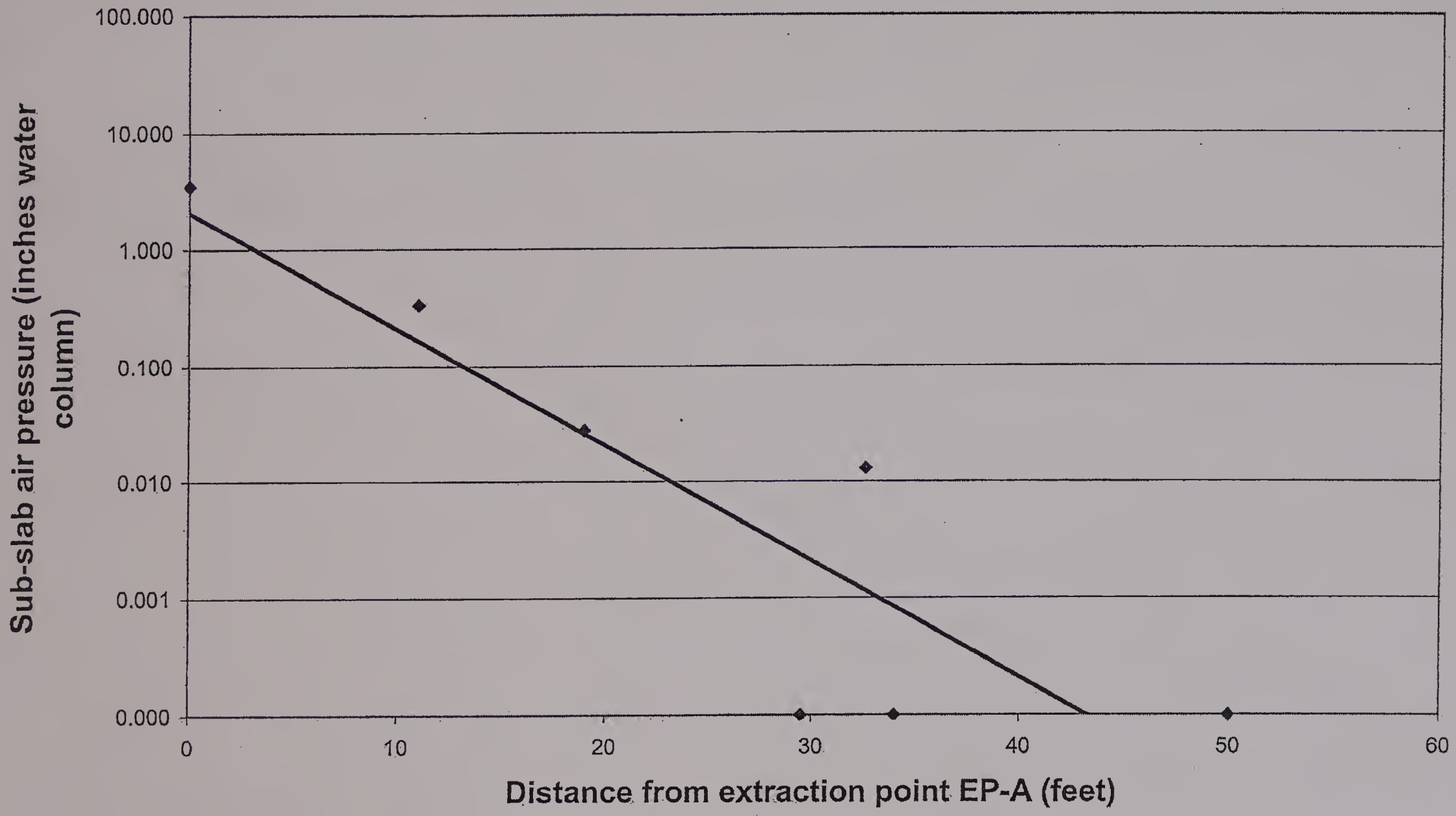
50 Tufts Street : Extraction Pilot Tests
Extraction from EP-B at 2.5 inches water vacuum



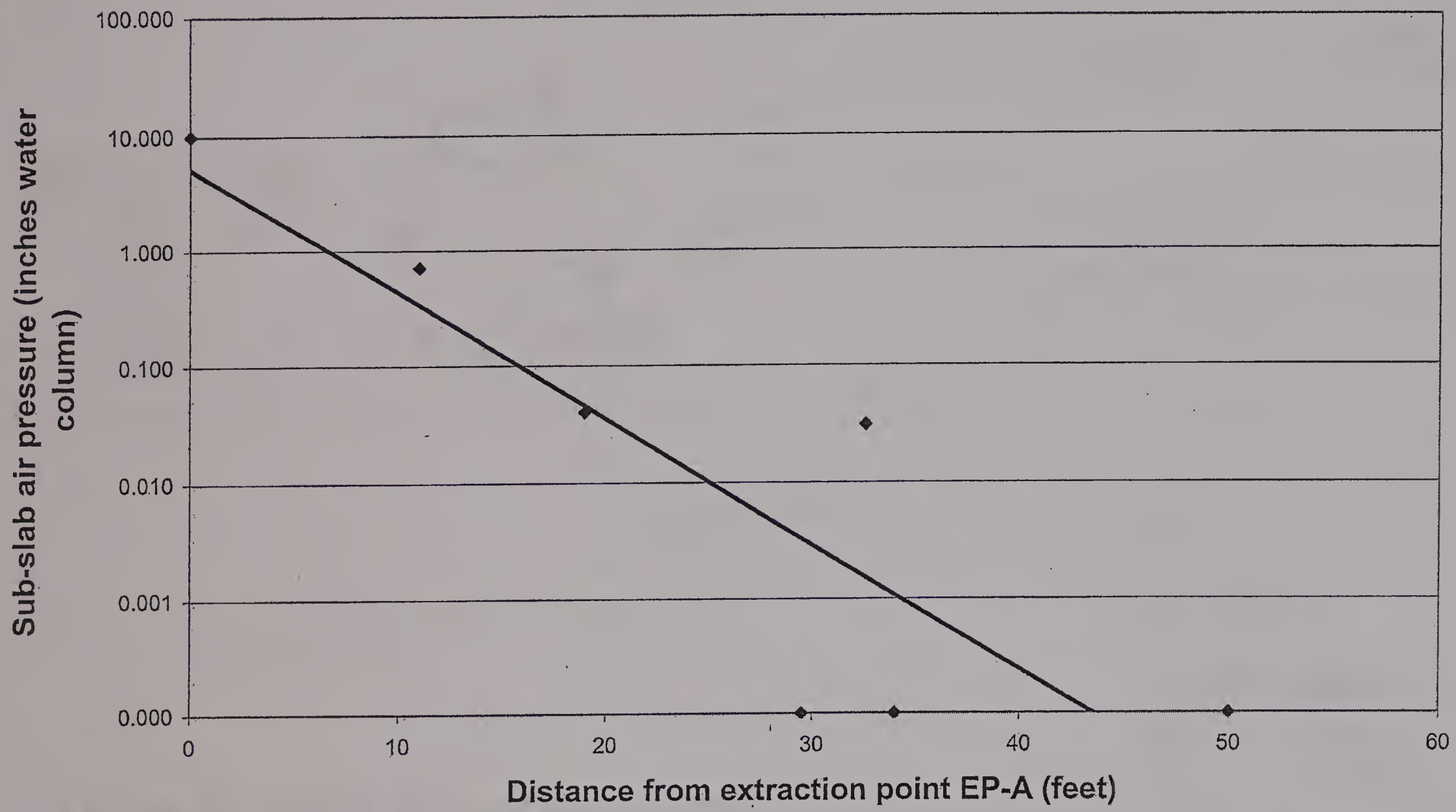
50 Tufts Street : Extraction Pilot Tests
Extraction from EP-A at 23.5 inches water vacuum

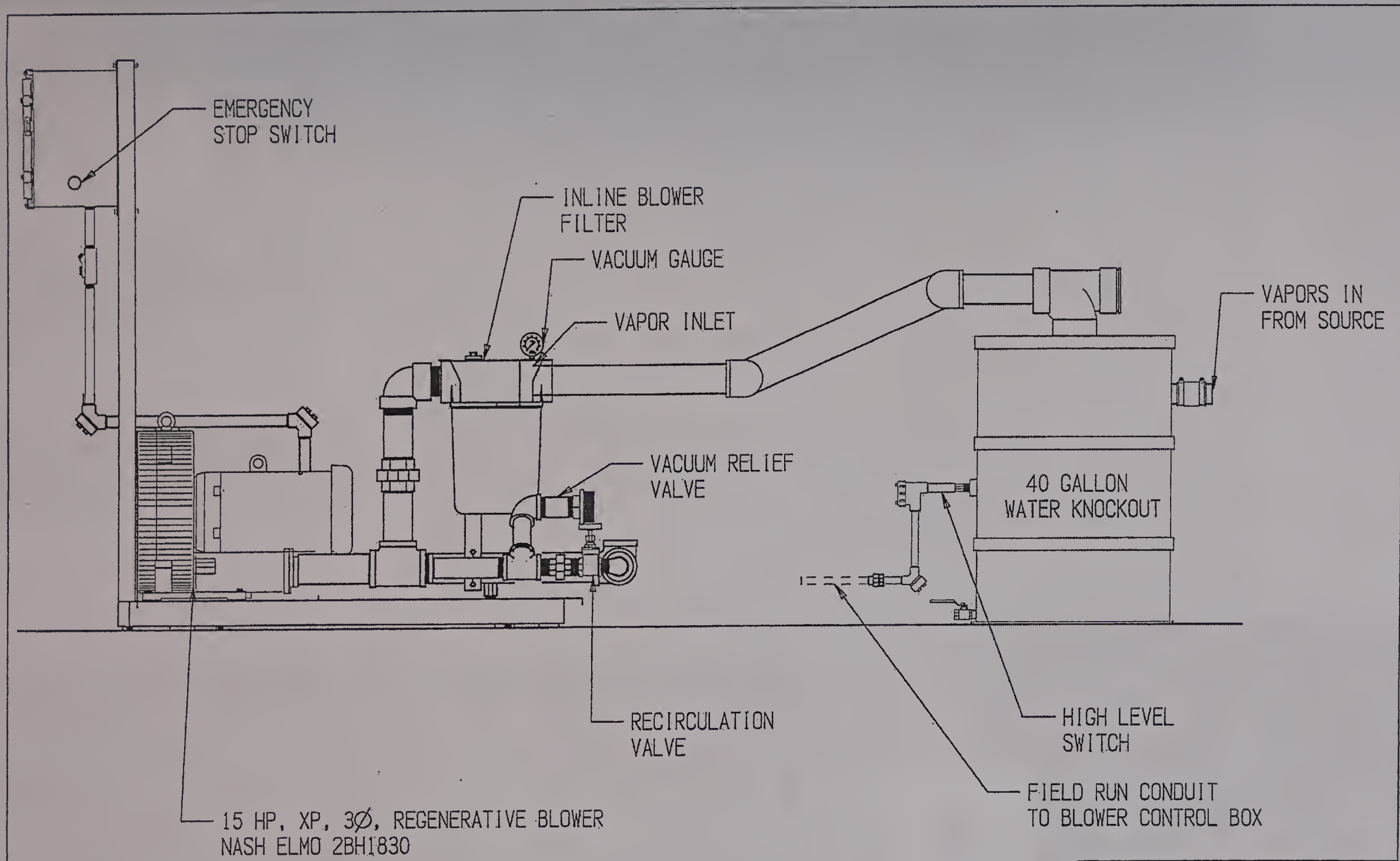


50 Tufts Street : Extraction Pilot Tests
Extraction from EP-A at 3.5 inches water vacuum



50 Tufts Street : Extraction Pilot Tests
Extraction from EP-A at 10.0 inches water vacuum





15 HP BLOWER ASSEMBLY-SIDE

FALMOUTH PRODUCTS, INC.		
SHEET: 1 OF 1	P.O. BOX 541 FALMOUTH, MA 02541U.S.A. PHONE: (508) 548-6686 FAX: (508) 548-8144	
SIZE: A		
SCALE: -		
DWG: FP040307	DRAWN BY: MW	CHECKED BY:
ASSY: F300	DATE: 4-4-07	REV: A
DESCRIPTION:	15 HP BLOWER ASSEMBLY: SIDE VIEW	

Wednesday, April 04, 2007 16:04:44X:\FM C US VCV units\300 Approval\300 VCV Approval Documentation\300 blow packages VCV\15 hp Standalone blower\15 hp Standalone assembly-side- no vcv.ckt

Water Technologies

Westates™ brand Vent-Scrub™ Vapor Phase Adsorbers

SIEMENS

APPLICATIONS

The Westates™ brand Vent-Scrub™ adsorbers have been proven to be the simplest and most cost effective way to treat malodorous and VOC emission problems. Sturdy steel construction and specially formulated corrosion resistant internal coating ensures long service life and low maintenance. Applications for Vent-Scrub™ adsorbers include:

- API separator vents
- VOC control from soil vapor extraction (SVE) systems and airstrippers
- Wastewater and product storage tank vents
- Process vents
- Refinery and chemical plant wastewater sewer vents
- Laboratory hood exhausts

INSTALLATION, STARTUP AND OPERATION

Siemens can provide a total service package that includes utilizing OSHA trained personnel providing on-site carbon changeouts, packaging and transportation of spent carbon for recycling at our reactivation facilities, where the contaminants are thermally destroyed.

We provide instructions on sampling the spent carbon and completion of our spent carbon profile form. Spent carbon acceptance testing can be performed at our certified laboratory. When requested, a certificate of reactivation will be issued.

BENEFITS AND DESIGN FEATURES

- Durable, carbon steel construction.
- Abrasion and corrosion resistant baked epoxy lining; urethane exterior finish (Vent-Scrub™ 1000, 2000, 3000, 8000 adsorbers).
- Ready-to-use systems: simple installation and operation.
- Applications to 3000 SCFM.
- The Vent-Scrub™ 1000, 2000, 3000 and 8000 adsorbers have forklift channels for easy handling.
- The Vent-Scrub™ 200, 400, 1000 and 2000 adsorbers are UN/DOT approved transportation containers for RCRA hazardous spent carbon.
- Hose kit and pipe manifold options are available to simplify installation and operation.

PIPING MANIFOLD (OPTIONAL)

- 2″/3″ sch 80 PVC piping and valves (optional carbon steel and stainless steel piping).
- Series or parallel operation.
- Sampling ports and pressure gauges.
- Flexible hoses with Kamlock fittings allow easy installation and removal during service exchange operations (Vent-Scrub™ 200, 400, 1000 and 2000 adsorbers).

SPECIFICATIONS					
Vent-Scrub™ Model No.	200	400	1000/2000	3000	8000
Dimensions, diameter x overall height	22" x 34"	30" x 43"	48" x 56"/48" x 8' 0"	60" x 9' 3"	96" x 11' 0"
Inlet Connection	2" FNPT	4" FNPT	4" FNPT	10" Flange	12" Flange
Outlet Connection	2" MPT	4" FNPT	4" FNPT	10" Flange	12" Flange
Manway	Top	Top	18" Top	16" Top	20" Top/Side
Internal Distribution(1)	PVC	PVC	PVC	FRP/PPL	FRP/PPL
Interior Coating	Epoxy	Epoxy	Epoxy	Epoxy	Epoxy
Exterior Coating	Enamel	Enamel	Epoxy/Urethane	Epoxy/Urethane	Epoxy/Urethane
Carbon Fill Volume (Cu.ft.)	6.8	14	34/68	107	273
Cross Sectional Area (sq.ft.)	2.8	4.9	12.3	19.6	50.2
Approx. Carbon Weight (lbs)	200	400	1000/2000	3000	8000
Empty Vessel Weight (lbs)	250	480	890/1190	2500	4500
Flow, CFM (max.)	100	300	500	1500	3750
Pressure, psig (max.)	3	3	14.9	5	5
Temperature, deg. F (max)(4)	140	140	140	140	140
Vacuum, in. Hg (max.)	N/A	N/A	12/12(2)	6(3)	12(3)

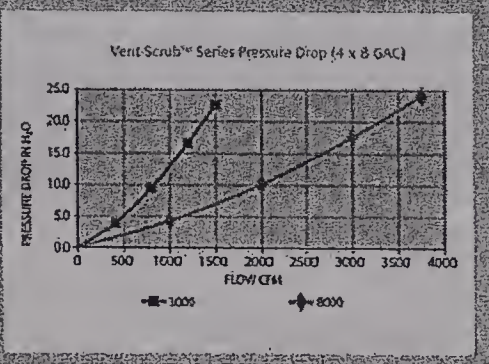
1Carbon steel and stainless steel internals are also available.
2For vacuum greater than 12 in. Hg on Vent-Scrub™ 2000, contact your Siemens representative.
3For vacuum service on Vent-Scrub™ 3000 and Vent-Scrub™ 8000, contact your Siemens representative.
4For higher temperatures, stainless and carbon steel internals are available.
For detailed dimensional information or drawings, contact your local Siemens sales representative.

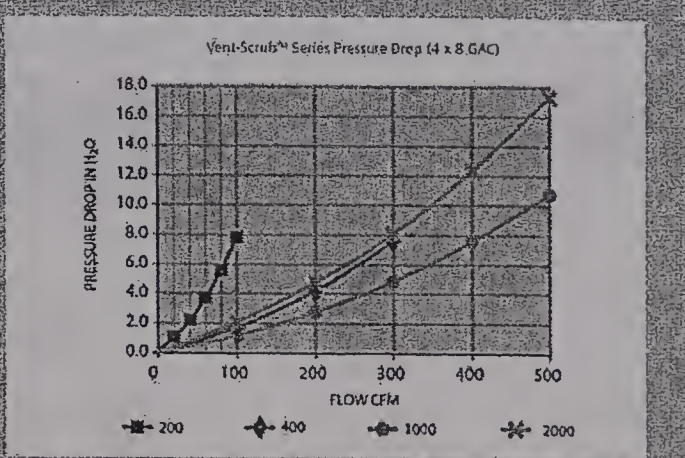
VENT-SCRUB™ ADSORBERS SAFETY CONSIDERATIONS

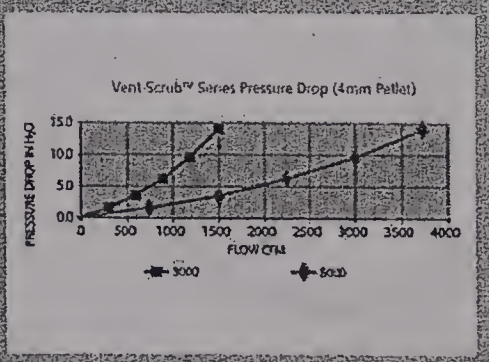
The adsorption of organic contaminants on activated carbon is an exothermic process, i.e. involves the release of heat.

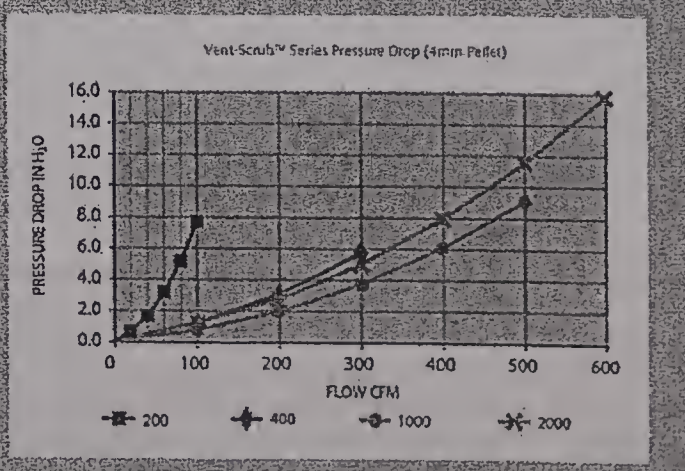
Certain chemical compounds such as ketones, aldehyes, organic acids and organic sulfur compounds may form reactive species on the carbon surface and under certain conditions may lead to a high temperature rise. If you are unaware or unsure of reactions that may occur, appropriate tests should be performed before installing the Vent-Scrub adsorbers.

At high VOC concentrations of organic compounds the heat of adsorption can lead to an increase in carbon bed temperature. The heat can be controlled by a number of techniques such a dilution of the inlet flow, nitrogen blanketing of the carbon system or prewetting of the carbon bed.









Siemens
Water Technologies

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2430 Rose Place
Roseville, MN 55113
800.525.0658 phone

Information.water@siemens.com
WS-VSC-DS-0207

EI-46 | EI-410

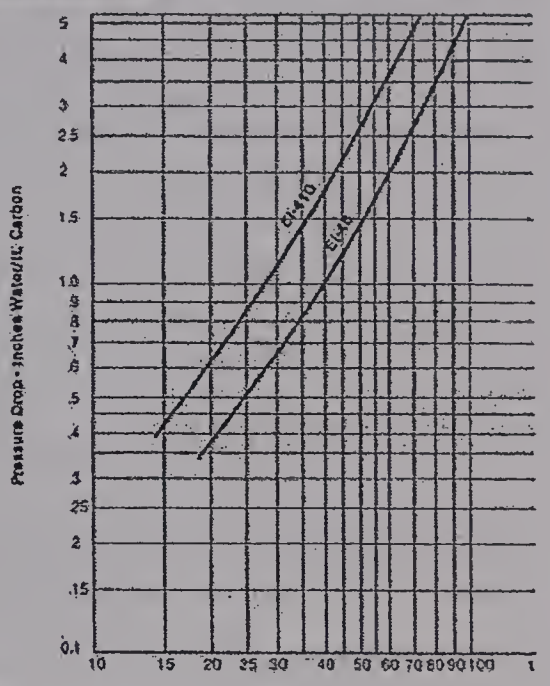
Envirotrol, Inc.

Product Description

EI-46 and EI-410 grade virgin activated carbons are manufactured from select grades of bituminous coal, which are activated at high temperatures under rigidly controlled conditions. The resulting product is characterized by high internal surface area, offering superior gas phase adsorption properties for a broad spectrum of organic compounds.

EI-46 and EI-410 grade activated carbons are very hard and attrition resistant resulting in low dust and high durability during operation and reactivation. Typical applications for EI-46 and EI-410 include: solvent recovery, odor control, tank vent adsorbers, HVAC, VOC control, Soil Vapor Extraction, Air Stripper Off-Gas, and Sub Part CC Compliance.

Grades are available in 200 lb net weight fiber drums or in bulk sacks containing 1000 lbs. net each. They are produced by steam activated process and are therefore excluded from IATA#395, IMCO CLass 4.2 or UN1362. Freight Classification: NMFC #40560; UFC - #20460



WET ACTIVATED CARBON DEPLETES OXYGEN FROM AIR.

All precautions must be taken since dangerously low levels of oxygen may be encountered.

Product Specifications

	EI-46	EI-410 *
Carbon Tetrachloride Activity (base):	60%	60%
Hardness Number (min.):	95	95
Mean Particle Diameter (mm):	3.7	3.0
Moisture (as packed, weight %):	2.0%	2.0%
U.S. Standard Sieve Size:	4x6	4x10
Greater than 4 mesh (max.):	5%	5%
Less than 7 mesh (max.):	10%	NA
Less than 10 mesh (max):	NA	4%
Apparent Density (dense packing, g/ml)	.44-.50	.44-.50
Total Surface Area (N2 BET, m2/g):	1050-1150 m_2/g	1050-1150 m_2/g
Ignition Temperature (Deg. C):	450	450

Shipping Infortmation: F.O.B. Points: Rochester, PA

Product Data Sheet
Edition 2.5.2007
Identification no. I631
Sikafloor 90

Sikafloor® 90

Clear, solvent-free, low viscosity epoxy flooring resin

Description

Sikafloor 90 is a clear (slightly amber), two-component, 100% solids, moisture tolerant, low viscosity, high strength, multipurpose, non-blushing epoxy resin.

Where to Use

- As a primer for epoxy mortars and epoxy self-leveling floor toppings.
- As an epoxy resin binder to form seamless, self-leveling epoxy mortar for patching, broadcast and heavy duty epoxy resin floor overlays.
- As a coating to resist wear and seal interior and exterior, above grade slabs from water, chlorides and mild chemical attack.
- As a topcoat/sealer on concrete, mortars and interior broadcast overlays.

Advantages

- No amine blush.
- Low mixed viscosity/excellent penetration.
- High resistance to moderate chemical agents at ambient temperature.
- High strength bonding to cement-based substrates.
- High mechanical strength/excellent physical properties.
- Easy to apply with brush, roller, squeegee or airless spray gun.
- USDA certifiable for incidental food contact.

Coverage

1 gallon yields 231 cu. in. (3,785 cm^3) of epoxy resin. When mixed with 1 gallon by loose volume of an oven-dried 70-mesh silica sand, yields approximately 289 cu. in (4,736 cm^3) of self-leveling floor topping. When mixed with 5 gallons by loose volume of oven-dried 20 – 40 mesh silica sand, yields approximately 808 cu. in. (13,240 cm^3) of epoxy mortar.
As a topcoat, neat: Approximately 140 – 285 sq. ft. / gal. (3.4 – 7.0 m^2 / liter) depending on application and substrate condition.
As a self-leveling floor topping: Approximately 25 sq. ft. / gal. (2.3 m^2 / liter) at 1/16 in. (1.5 mm) thick.
As an epoxy mortar: Approximately 44 sq. ft. / gal. (1.1 m^2 / liter) at 1/8 in. (3 mm) thick.

Packaging

2.6-gallon (10 liter) unit: 1 pail (A) and 1 can (B) Component A: 3 gal metal pail Component B: Carton containing (2)* 1 gal cans. Order 2 Pails of Part A and one carton of Part B (2 cans per carton).

Typical Data *(Material and curing conditions @ 73°F (23°C) and 50% R.H.)*

Shelf Life 2 years in original, unopened containers.
Storage Store dry at 40°-90°F (5°-32°C). **Condition material to 65°-86°F (18°-30°C) before using.**
Color Clear, slightly amber.
Mixing Ratio Component 'A': Component 'B' = 2:1
Viscosity (Mixed) 500 cps.
Pot Life (250 g mass): 40 minutes

	60° (15° C)	73° (23°C)
Tack-Free Time	9 hrs.	6 hrs.
Re-coatable	20 hrs.	16 hrs.
Pedestrian Traffic	30 hrs.	24 hrs.
Light Mechanical Traffic	60 hrs.	48 hrs.
Full Cure	10 days	7 days
Max. Waiting Time Between Coats	3 days	2 days

Compressive Strength (ASTM D-695) neat, psi (MPa)

	73°F* (23°C)*	90°F* (32°C)*
1 day	290 (2)	4,785 (33)
2 day	4,495 (31)	8,700 (60)
3 day	7,395 (51)	9,715 (67)
7 day	10,295 (71)	10,875 (75)
14 day	11,745 (81)	11,165 (77)
28 day	11,745 (81)	11,165 (77)

Tensile Properties (ASTM D-638):
Tensile Strength 7,395 psi (51 MPa)
Elongation at Break 4.0%
Flexural Properties (ASTM D-790)
Flexural Strength (Modulus of Rupture) 13,920 psi (96 MPa)
Tangent Modulus of Elasticity in Bending 3.3×10^5 psi (2,300 MPa)
Abrasion Resistance (ASTM D-1044)
Taber Abrader (H-22 wheel, 1,000 g /1,000 cycles) Weight Loss - 1.38 g
Impact Resistance (MIL D-3134) 30 in-lbs.
Bond Strength (ASTM D4541)
2,900 psi (20 MPa)
2,175 psi (15 MPa)
Water Absorption (ASTM D-570) 7 day (2 hr. boil) 1.34%

How to Use

Surface Preparation

Surface must be clean and sound. It may be dry or damp, but free of standing water. Remove dust,laitance, grease, curing compounds, bond inhibiting impregnations, coatings, waxes and other contaminants.
Preparation Work: All projections, rough spots, etc. should be dressed off to achieve a level surface prior to the application.
Concrete: Should be cleaned and prepared thoroughly to achieve a laitance-free and contaminant-free, open textured surface by blastcleaning or equivalent mechanical means (CSP 1-3 per ICRI guidelines). New concrete should have a minimum compressive strength of 3,500 psi (24 MPa) at 28 days and minimum tension of 200 psi (1.4 MPa) at time of application. Slabs contaminated below the surface by long-term exposure to oils and spills may require more extensive preparation. Contact Sika Technical Services at 1-800 933-SIKA for further information.

Mixing

Pre-mix each component. Empty entire content of component A and component B into a clean mixing pail or proportion 1 part **Component 'B'** to 2 parts **Component 'A'** into a clean mixing container. To minimize air entrapment, mix thoroughly for 3 minutes with a Sika paddle and a low speed drill (300 – 450 rpm) until uniformly blended. While mixing, scrape the sides and bottom of the pail at least once to ensure thorough mixing. Mix only that quantity that can be used within its Pot Life.
To coat or seal interior slabs or above grade exterior slabs: Use the mixed Sikafloor 90 resin neat.
To prepare a self-leveling mortar: Slowly add 1 part by loose volume of an oven-dried 70 mesh silica sand to 1 part mixed Sikafloor 90 resin and mix until uniform in consistency.
To prepare an epoxy mortar: Slowly add 5 parts by loose volume of an oven-dried 20 – 40 mesh aggregate to 1 part mixed Sikafloor 90 resin and mix until uniform in consistency.

Application

To coat or seal interior or above grade exterior slabs: Spread neat mixture of Sikafloor 90 resin over slab using flat rubber squeegees and/or high quality rollers, working material thoroughly into the substrate to ensure penetration. Coverage should be uniform and not left to puddle or pond. Coat interior slabs or exterior above grade slabs only.
For self-leveling flooring: Prime prepared substrate with neat mixture of Sikafloor 90 resin using a brush, working material thoroughly into the substrate to ensure penetration. Remove excess to prevent surface film. Place self-leveling mortar before primer becomes tack free. Apply the self-leveling mortar using a ⅛ in. (3 mm) notched trowel or spreader (rubber or steel). Immediately work down with a spiked roller to ensure uniform thickness and remove entrapped air. Use a smaller flooring trowel or spreader around edges of floor.
For epoxy mortar: Prime prepared substrate with neat mixture of Sikafloor 90 resin using a brush, working material thoroughly into the substrate to ensure penetration. Remove excess to prevent surface film. Place prepared epoxy mortar before primer becomes tack free. Place the epoxy mortar using trowels. Compact and level with vibrating screed or trowels.

Chemical Resistance		
Test Medium	1 day	1 month
Wine	R	R
Beer (Fresh)	R	R
Isopropanol	T	T
Jet Fuel	R	R
Ethanol	T	T
Mineral Spirits	R	R
Cutting Oil	R	R
Aluminum Chloride 50%	R	R
Ammonium Chloride 50%	R	R
Boric Acid 30%	R	R
Lactic Acid 20%	T	T
Acetic Acid 5%	T	T
Sodium Hydroxide 50%	R	R
Sulfuric Acid 20%	R	R
Nitric Acid 10%	R	R
Hydrochloric Acid 15%	R	R
Milk	R	R
Industrial Detergent	R	R

R = Prolonged Resistance
T = Temporarily Resistant
N = Non-resistant
(tested to destruction/test discontinued)

Limitations	■ The use or addition of Sikaflex-2c Color Paks or any other pigments or dyes in order to change the appearance or color of the coating prior to application is prohibited. ■ Do not apply or cure in direct sunlight. ■ Minimum substrate temperature 50°F (10°C). Maximum application temperature 95°F (35°C). ■ Substrate temperature must be 5°F (3°C) above measured dew point, maximum rela tive humidity during application 95%. ■ For self-leveling and epoxy mortars, use oven-dried aggregate only. ■ Materlal is a vapor barrier after cure. Do not seal exterior slabs on grade. ■ Maximum epoxy mortar thickness is 1.5 in. (38 mm) per lift. Epoxy mortar is for interior use only. ■ Minimum age of concrete is 21 – 28 days depending on curing and drying conditions. ■ On green or damp concrete, Sika EpoCem can be used as a pore filler to reduce vapor drive and potential osmotic blistering. ■ Determine the surface moisture content by using an impedance moisture meter de signed for use on concrete as detailed in ASTM E-1907. Acceptable test results shall be 4% by mass or less. If over use Sikafloor Epocem 81/82. ■ Conduct quantitative anhydrous calcium chloride testing in accordance with ASTM F1869. Maximum acceptable test result is 3 pounds per 1,000 ft² per 24 hours. If over use Sikafloor Epocem 81/82. ■ Do not encapsulate saturated concrete in areas of freezing and thawing. ■ Appearance may alter due to variations in lighting and / or UV exposure. ■ All repairs required to achieve a level surface must be performed prior to application.
Warning	**IRRITANT, SENSITIZER:** Part 'A' contains Aromatic Hydrocarbon, Ethyl Hexyl Glycidic Ether and Modified Epoxy Resins. Causes eye irritation. May cause skin/respiratory irritation. Prolonged skin/respiratory contact may result in allergic reaction, sensitization. Harmful if swallowed. **HMIS Rating: H-2, F-2, R-0, PPE-D** **CORROSIVE, IRRITANT, SENSITIZER:** Part 'B' contains 2,4,6-Tri(Dimethylamino-methyl)phenol and Amine and Epoxy Copolymer. Contact with skin and eye causes severe burns. Causes eye/skin/respiratory irritation. Prolonged skin contact may result in allergic reaction, sensitization. Harmful if swallowed. May cause dizziness, nausea, vomiting. Use only in well ventilated areas. **HMIS Rating: H-3, F-2, R-0, PPE-D.** **Deliberate concentration of vapors for purposes of inhalation is harmful and can be fatal.**
First Aid	**Eyes** – Hold eyelids apart and flush thoroughly with water for 15 minutes. **Skin** – Remove contaminated clothing. Wash skin thoroughly for 15 minutes with soap and water. **Inhalation** – Remove to fresh air. **Ingestion** – Do not induce vomiting. Dilute with water. Contact physician. **In all cases contact a physician immediately if symptoms persist.**
Clean Up	Use personal protective equipment (chemical resistant goggles/gloves/clothing). In absence of adequate ventilation, use properly fitted NIOSH approved respirator. Without direct contact, remove spilled or excess product and place in suitable sealed container. Collect with absorbent material. Uncured material can be removed with approved solvent. Follow solvent manufacturer's instructions for use and warnings. Cured material (when Component 'A' combined with Component 'B') can only be removed mechanically. Dispose of excess product and container in accordance with current applicable environmental regulations.

KEEP CONTAINER TIGHTLY CLOSED
NOT FOR INTERNAL CONSUMPTION

KEEP OUT OF REACH OF CHILDREN
FOR INDUSTRIAL USE ONLY

CONSULT MATERIAL SAFETY DATA SHEET FOR MORE INFORMATION

Sika warrants this product for one year from date of installation to be free from manufacturing defects and to meet the technical properties on the current Technical Data Sheet if used as directed within shelf life. User determines suitability of product for intended use and assumes all risks. Buyer's sole remedy shall be limited to the purchase price or replacement of product exclusive of labor or cost of labor.

NO OTHER WARRANTIES EXPRESS OR IMPLIED SHALL APPLY INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SIKA SHALL NOT BE LIABLE UNDER ANY LEGAL THEORY FOR SPECIAL OR CONSEQUENTIAL DAMAGES. SIKA SHALL NOT BE RESPONSIBLE FOR THE USE OF THIS PRODUCT IN A MANNER TO INFRINGE ON ANY PATENT OR ANY OTHER INTELLECTUAL PROPERTY RIGHTS HELD BY OTHERS.

Visit our website at www.sikaconstruction.com 1-800-933-SIKA NATIONWIDE

Regional Information and Sales Centers. For the location of your nearest Sika sales office, contact your regional center.

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Phone: 52 442 2385800
Fax: 52 442 2250537

QUALITY ISO 9001 9002 ACHIEVEMENT

Quality Certification Numbers: Lyndhurst: FM 69711 (ISO 9000), FM 70421 (QS 9000), Marion: FM 69715, Kansas City: FM 69107, Santa Fe Springs: FM 69408

Geotechnical
Environmental and
Water Resources
Engineering